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# The MODEL ENGINEER & PRACTICAL ELECTRICIAN

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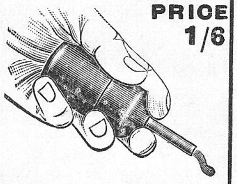

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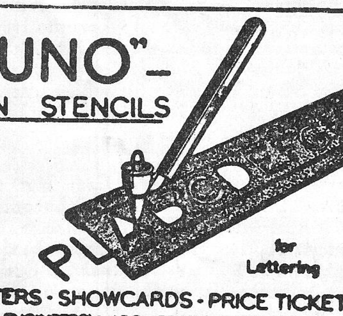

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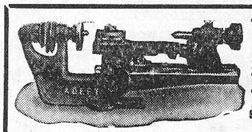

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# SMOKE RINGS

### Model Aviation Development.

ALTHOUGH Great Britain can easily hold its own in technical knowledge and achievement in model aviation, we are still, as a nation, far from being as air-minded as some countries overseas, notably the United States of America. For this reason model aviation does not receive the practical support and encouragement it should do, either from the Government, or from local authorities, who can at least assist by providing the flying-ground facilities which are badly needed in many districts. In my speech at the Wakefield Cup Dinner, I ventured to suggest four directions in which interest requires stimulating in this country. These are (1) greater Government recognition of the value of model aviation in assisting technical research and in developing the public understanding and appreciation of air-travel, and of the value of aircraft in national defence ; (2) Greater assistance from local authorities in the provision of suitable flying-ground facilities ; (3) the encouragement of aeronautical studies, and aero-modelling, in schools and technical colleges, and (4) a more serious attitude, and a more generous recognition on the part of the national press, in regard to the activities of model flying clubs and their individual members. Taking the last suggestion first, we seem still to be a long way from convincing the lay press that model aeroplanes, or indeed models of any kind, are anything more than children's toys. I think the success of the Wakefield Cup Team has done something to make the lay press realise that model aeroplane building and flying is an art requiring considerable technical knowledge and handicraft skill, and that it has a distinct national value. Many of the officials and members of model flying clubs can do useful work in educating local editors and press representatives as to the meaning and importance of their activities. They should endeavour to see that their meetings are as regularly reported as are the local concerts, and cricket and football matches, and that the technical aspect of their achievements is suitably presented in these reports. Publicity of this kind will be most helpful in getting the sympathetic interest of local authorities in the provision of flying-ground facilities. Parks and open space committees naturally have to consider the well-being of the public generally, and they are sometimes rather diffident about giving special user-privileges affecting a particular open space, to one section of the community. They are also concerned with the possible danger to spectators from model machines in flight. But they already provide space for cricket, tennis, bowls, and other popular pastimes, and when they realize the rapidly growing interest in model aviation, and the importance to the country of its wise encouragement, they will no doubt take a more benevolent view of applications for permission for flying meetings. Most schools have private playgrounds or playing fields at their disposal. Possibly local model flying clubs might look in this direction for opportunities for holding flying meetings. Here again, the authorities will require convincing of the value of model aviation, but once this has been achieved, the subject may well receive greater attention in the schools themselves, and encouragement be given to the boys to study aeronautics and build and fly well-designed model planes. I recently had an enquiry from the American Embassy in London, asking for full information as to the development of model aviation in this country. I am informed that the United States Government is greatly interested in fostering this movement in their own country, and is taking steps to find out what other countries are doing in a similar way. I can well imagine

that our own Government has plenty of other, and more important, matters to occupy its attention at the moment, but it is not too much to hope that one day Downing Street will give its official blessing to model aviation, and take some practical steps to encourage its national development. Meanwhile much depends on the energies of the existing clubs themselves. They have it in their power to stimulate and guide public interest in their work, and, by helpful encouragement and advice, to direct the footsteps of the younger generation into the right path. They can do much to advance the "air-mindedness" of the nation, a mental attitude which will have a great influence on the future of the British Empire.

* * *

### "M.E." Exhibition Entries.

I THINK it desirable to remind intending competitors at our forthcoming Exhibition that the closing date for returning entry forms is August 24th. Nearly every year I have to refuse some entries which arrive after the official closing date, but I hope that this year everybody will return their forms in good time. The actual models are, of course, not required till the middle of September, but we have to complete the list of entries in good time, so as to prepare the Official Catalogue, and arrange for a suitable space for staging the models. If you have not got your form, send for it now, and return it to us not later than August 24th.

* * *

### Some Further Exhibition Prizes.

I AM very pleased to record an addition to our exhibition prize list, of two prizes of £1 1s. each to be awarded at the discretion of the judges as consolation prizes to those who just miss a more important award. This generous offer comes from Mr. Charles B. King of Larchmont, New York, and I have accepted it with pleasure as a token of good-will from an overseas reader, who desires to extend recognition and encouragement to some deserving competitors. I am sure that those who are fortunate enough to be selected for these prizes will appreciate the spirit in which they are offered, as much, or more than, the actual amount of the prize.

* * *

### A Northern Model Aero Rally.

THE Second Annual Northern Rally of Aeromodellists will be held at the Manchester Airport, Barton, on Sunday, 20th September, at 12 noon. Competitions for duration, gliding, and flying scale models will be run during the afternoon and the prizes include a silver cup presented by the Lancashire Aero Club. A special team prize will also be awarded to the model club team of two who gain the highest marks for distances travelled and for positions gained in the contests. All entries must be made *not later than September 18th*, on the special form which, together with full details of the contests, can be obtained from Mr. J. Pearce, 26, Elms Road, Heaton Moor, Stockport.

* * *

### A New Zealand Appreciation.

I AM indebted to Mr. Ken Dickie of the Wellington (N.Z.) Model Engineering Society for sending me a copy of a whole-page article on model making which appeared in the local newspaper *The Dominion*. The article is written by Mr. W. J. Finlayson, and is one of the best appreciations of the interest and value of model making which I have yet seen in the lay press. It is illustrated by a selection of photographs of excellent models made by members of the Wellington Society, and Mr. Finlayson discourses in a most informative manner on the attractions of the various branches of model engineering. The Editor of *The Dominion* is to be complimented on giving space so generously to this subject, and I am sure many of his readers will be grateful for this novel and inspiring page. I quote the following lines with which Mr. Finlayson concludes his article :—"What does it teach us, this model-building? The answer is most of those attributes which go towards the building of character. Go along to a model engineering society or a model aeroplane club, and listen to a person, normally shy, and diffident, holding forth vigorously on his own particular beliefs. He is learning the valuable art of public speaking. Watch a harassed business man dismantling a locomotive; his eyes are serious with a new purpose; the trials of commerce have been forgotten; he is enjoying a short priceless period of relaxation. Observe a clumsy-handed individual struggling with a miniature oil lamp, essential for his scale model coastal scow. How else would he force himself to be so infinitely patient, and so painstakingly accurate? Above all, whoever and whatever a model-builder may be, when he indulges in his hobby he is getting out of his rut, he is doing something different, temporarily he is another being and in the fullness of that realisation he is a happy man. He may be almost a bankrupt, he may have domestic worries, he may be a pestered record-breaker, but all these worries are forgotten. What happens to the world is of little account, as long as the enamel goes on well, or the valve gear works at the first attempt. In truth, here is the only certain way to forget the world and its troubles—modelcraft."

Percival Marshall

# Making Small Sliding Resistances.

By "ARTIFICER."

THE amateur experimenter often requires a small variable resistance or "rheostat" for the purpose of regulating the speed of a fractional horse-power motor, or controlling the potential applied to some piece of apparatus. In cases where low voltages are applied, valve filament rheostats, as formerly used in wireless for controlling bright-emitter valves, and now obtainable for next to nothing at the local junk store, generally afford a simple solution; but resistances to operate from the mains are quite another matter, as they must have a high ohmic value, and also be very carefully insulated with a heat-resisting material, since they have to dissipate a fairly large amount of electrical energy in the form of heat.

The exigencies of daily routine in an electrical laboratory once brought the writer in contact with the need for resistances of all sorts and sizes, which had to be produced at almost a moment's notice from the materials which were to hand. As a result, methods were evolved for making satisfactory resistances simply and quickly, and these are passed on to the reader in the hope that they will be of some practical use.

## Resistance wires.

The first thing to be considered when making up a resistance is the kind of wire to be employed and the amount of it which will be required. There are very many kinds of resistance wire made, practically all of which are suitable for the purpose we have in mind, though actually intended for widely different specific purposes. Among the alloys employed for general use in rheostats, the most common are nickel silver (or German silver) in various grades, Eureka, and Manganin. Nichrome, nickel-chromium-iron, iron-free nickel chromium, and various similar alloys are made specially for resistances which have to operate at high temperature, up to a red heat, under which conditions the ordinary alloys would either melt or oxidise rapidly. Constantan is a resistance alloy designed to maintain practically a constant resistance at any temperature, and is thus used largely for calibrating purposes in electrical instruments, and also, in conjunction with other metals, for thermo-couples employed in electric thermometers and pyrometers. Iron or steel wire is quite suitable for resistance purposes, but its coefficient of resistance varies widely with temperature, and it is also liable to rapid deterioration when heated, even though well below a dull red. For some purposes, the increase of resistance at high temperature is an asset, and may be used to effect a governing influence, as, for instance, in the case of the ballast resistance sometimes used on ignition coils, which heats up if left in circuit when the engine is idle, and reduces wastage of current, besides saving the coil from damage.

## Amount of wire required.

There is often great difficulty in finding out just what resistance is required for a given purpose, and further, in finding what length and gauge of wire is needed to produce this resistance. As a matter of experience, it may be said that a small (say 1/20 h.p.) fractional h.p. motor, running on 220 volts, will require a maximum resistance of about 1,000 ohms in series to give a full range of control from a mere "tick-over" to full speed, and that it should be capable of carrying at least ¼ ampere without a very great rise in temperature. Most of the small motor regulating resistances which I have constructed were wound from 36 gauge Eureka wire, about 70 yards of which are required to give the value stated. This gauge of wire will carry .28 amperes with a rise of temperature of 100 degrees centigrade, if wound on an open former. Allowing 200 degrees rise of temperature, it will carry nearly half an ampere. It is permissible to use as fine a gauge as 40 swg. for resistances used for light intermittent work, in which case only about 30 yards are required, and the carrying capacity is .15 amperes at 100°C., or .24 amperes at 200°C. rise of temperature. These figures, it should be noted, are only approximate, any error being on the right side for practical purposes.

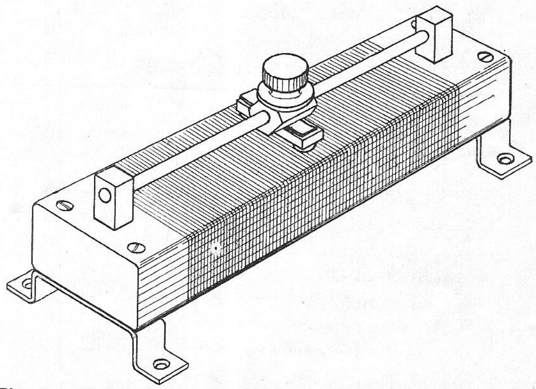


**Fig. 1.—Sliding resistance with rectangular slate former and double ball contact slider.**

## Measuring unknown resistances.

The experimenter must always be of an acquisitive nature (unless he is a millionaire, in which case he wouldn't trouble to be an experimenter) and will usually have odd quantities of wire to hand, the specification of which is unknown. Fig. 2 shows a rough and ready means of testing the resistance of any sample of wire, by means of an ammeter and a battery of known voltage. Stretch out a length of the wire on a board or on the bench between two nails, and using heavy leads, connect up the battery and ammeter in series with the wire at one end, close to one of the nails. The other lead of the circuit is used as a sliding contact, and is moved along the resistance wire until a definite figure is shown on the ammeter. It is very desirable to connect a voltmeter across the battery terminals as a check on possible voltage drop while the test is being made.

Suppose that a 2-volt accumulator is used, and the reading shown on the ammeter is ½ ampere, Ohm's law will give the resistance of

the *complete circuit* as 4 ohms. If the internal resistance of the battery, the leads, and the ammeter are so low that we can neglect them, which is usually the case in practice, the 4 ohms can be taken to represent the resistance of the length of wire between the lead contacts, and the computation of any ohmic value becomes a mere matter of linear measurement and simple arithmetic. It should be quite clear, however, that this method is only advocated for the purpose at present under consideration, and is quite useless for exact calibration. Some information on this subject, including a table of resistances for Eureka wires of various gauges, will be found in an article by Mr. Geo. Gentry in the issue of the "M.E." dated July 2nd, 1936.

**Resistance Formers.**

Several kinds of insulating materials are employed for formers on which to wind the resistance wire, the most common being slate, earthenware and asbestos (or its compositions). Metal tubes coated heavily with vitreous enamel are sometimes used for resistance formers, but their smoothness makes them rather unsuitable for sliding resistances, as the coils of the wire are liable to shift under the pressure of the slider. In this respect, asbestos gives the best grip, but unless it is pretty hard the wire may become deeply imbedded, so that contact with the slider is impaired. An

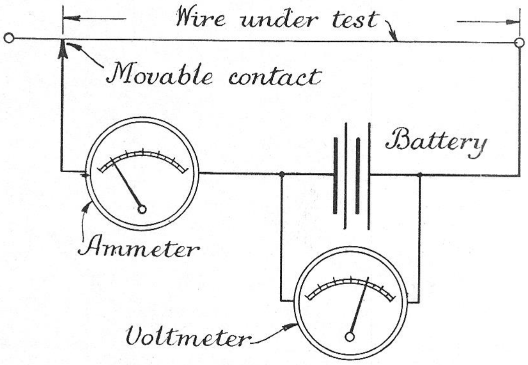



**Fig. 2.**—A simple method of finding the resistance of a sample of wire.

excellent former may be made by wrapping an iron pipe with a sheet of 1/16″ asbestos millboard which has been soaked in a mixture of water and sodium silicate ("waterglass," as used for preserving eggs). The millboard should just be long enough to butt nicely round the tube and should be smoothed down by rolling while damp, and then thoroughly dried. Asbestos plaster should not be used for a former, as it is sufficiently hygroscopic to absorb a certain amount of water vapour, but not to allow it to escape rapidly when heated, and it may burst through internally-generated steam. Slate has the advantage that it can be filed, turned or otherwise machined to any shape required, and it is very commonly used in square or rectangular form, with the corners slightly rounded to avoid undue strain on the wire.

The size of former required can be roughly estimated from the length and diameter of wire to be used.

Suppose, for instance, that 70 yards of No. 36 gauge wire are employed. This, if wound on a round former $1\frac{1}{2}$ in. dia., will work out at about 500 turns, and if these are spaced 50 to the inch, the coil will be 10 in. long. It would, however, be possible to space the turns closer by careful winding, as the diameter of 36 gauge wire is .0076 in., enabling as many as 100 turns per inch to be wound without touching; but this will depend upon the facilities available.

**Winding the Coil.**

This is quite a simple matter if a small screw cutting lathe is available, as the wire can

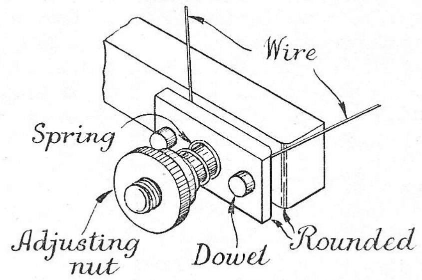



**Fig. 3.**—Wire tensioning device.

be laid on the former perfectly evenly by means of a guide held in the tool post, and traversed at the desired rate by the screw cutting gear. It is necessary, of course, to set up a train of wheels which will give the proper spacing, at any rate approximately. The working out of these trains is hardly practicable here, as so much depends, not only upon the wheels available, but also on the space limits of the quadrant and studs upon which they are mounted. Generally, however, it is a fairly simple matter to set up a fully compound train of wheels to a sufficiently fine pitch for the purpose in hand.

The guide employed for laying on the wire should incorporate a friction device for evenly tensioning the wire. A simple arrangement which has been found very satisfactory in practice is shown in Fig. 3, consisting of a bar held in the tool post, with a friction plate pressed against it by an adjustable spring. The wire is passed between the bar and the plate, around the central stud, which should be plain (i.e., not threaded) at this point. The bend made in the wire helps to smooth out slight kinks, and in the case of wire which is very crooked, it may be given one or more

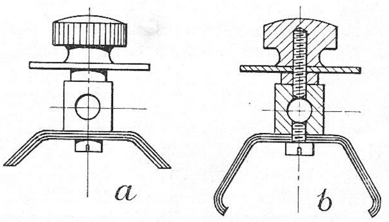



**Fig. 4.**—Laminated sliding contacts for flat and round formers respectively.

extra bends over the guide dowels, but use discretion about this, as kinked wire is generally brittle, and the wire, when laid on the former, may be just about ready to fall to pieces

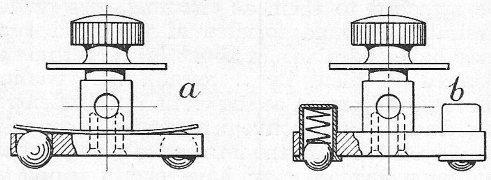



Fig. 5.—Two types of ball contact sliders.

Excessive tension on the wire may tend to stretch it, increasing the resistance and decreasing the carrying capacity.

Arrange the reel of wire which is to be wound on the former in a convenient position parallel and not too close to the job, supported by a spindle on which it can run freely. Watch out for any tendency of the reel to jam and break the wire; a light jockey pulley resting on the wire serves as a tension indicator—do not test it with the hand, as fine wire can make a nasty cut.

There should be very little difficulty in winding No. 36 gauge wire in this way, but 40 gauge or finer wire calls for great delicacy in handling. The lathe should not be run too fast, particularly if a rectangular former is employed, as there is a tendency to snatch at the corners.

If no screw cutting lathe is available, even winding is not so easy, but by winding on two wires, and afterwards removing one of them, a definite space between every turn is assured. The main difficulty in hand winding, however, is in ensuring uniform and sufficient tension on the wire. Handle the wire with a leather glove, for the reasons stated above, when it is necessary to run the wire continuously through the fingers. It might be possible to employ a tensioning tool guided by hand, but the writer has not tried this method.

The starting and finishing ends of the wire must be positively secured, and in cases where a solid former is employed, they may be attached to a bolt passing right through it and fitted with a terminal nut. Tubular formers of hard material may also be fitted with a bolt inserted from the inside, but when asbestos is employed, it is best to pierce a couple of small holes and " sew " the wire in, afterwards covering the stitch with a clamping band, fitted with a terminal bolt.

**The sliding contact.**

This is one of the most important features of the whole rheostat, and is only too often

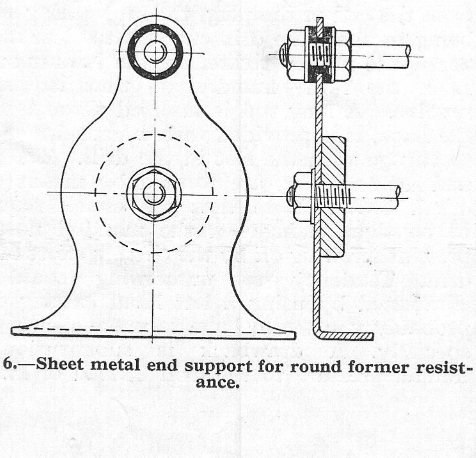


Fig. 6.—Sheet metal end support for round former resistance.

badly carried out. It is most important to ensure a smooth and easy sliding action, and at the same time a positive electrical contact all along the former, otherwise the slider may jam and break the wire, or the contact may arc and burn through the wire. The most common type of slider is that having a laminated spring contact, as shown in Fig. 4, *a* being employed in conjunction with flat formers, and *b* with circular formers. The contact blades are made of phosphor bronze or hard brass, about .015" to .020" thick. This type gives excellent contact over a good area, and if well fitted, is smooth in action; but in the experience of the writer, it is not the best type for a resistance which gets a great deal of use, as it is not a long-wearing contact, and sooner or later will inevitably cut through the wires. Better results have been obtained with a ball contact slider, as shown in Fig. 5. The form shown at *a* has two fairly large diameter balls dropped into holes in a flat bar, and loaded by a flat steel spring, sandwiched between the bar and the barrel of the slider, to which it is secured by two countersunk screws. The holes for the balls are first drilled undersize,

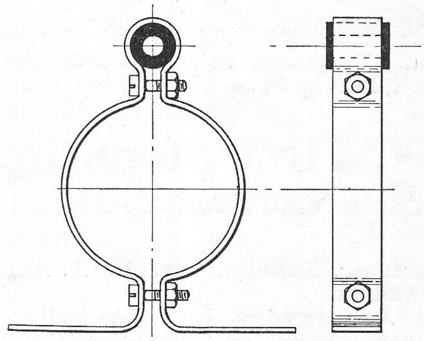


Fig. 7.—Strip metal clamp support.

and the clearance holes are not continued right through the bar, in order to prevent the balls dropping out when the slider is dismantled. At *b* is shown a ball contact employing separate spring-loaded ball catches, such as are used for cupboard doors, etc., and obtainable, complete with barrel and spring, at a very low price.

The use of steel balls for contacts may be open to criticism, but it should be pointed out that they never actually break contact, and if any tendency to pitting is observed, they are very easily replaced. If desired, bronze balls may be used instead. The writer has encountered no trouble whatever with them, and has also used roller contacts on similar principles, but these are not so simple in construction.

The slider barrel should be sufficiently long to avoid any tendency to tilt or jam on the bar, and may conveniently be made of square or hexagonal material to facilitate cross drilling to take screws securing the knob and contact. A fairly rigid bar is required to carry the slider, and in the case of the slate former of the resistance shown in Fig. 1, it is secured by rivetting to two end pillars, which terminate in bolts passing through the former. Note that the nuts must be countersunk below the surface of the former, to avoid making contact with the metal supporting strips. The bar

will, of course, be "alive" in normal use, and should be fitted with a terminal nut for connecting up.

Some commercially-made resistances have springs under the pillars holding the bar, which serve to apply contact pressure to a more or less rigid contact member. This is not a very good feature, as the pressure varies as the slider is moved along the bar, and at the two ends the contact is liable to tilt and jam.

The operating knob must of course be well insulated, and may be made from solid ebonite. It should be large enough for an adequate grip, and in order to prevent touching live metal parts when operating it, a large washer of the same material—the larger the better—should be placed underneath it.

It is sometimes more convenient to operate a resistance by a rotary or radial lever motion, and the arrangement of this depends largely upon the actual design, but in some cases the slider bar can be screwed with a quick thread, and the barrel screwed internally to engage it. A flat former is well adapted to the use of a radial lever contact, which may be found useful in such cases as a sewing machine motor controller, operated by a foot pedal.

**Supports.**

Flat formers present little difficulty in the design of supports, as almost any kind of bracket, bent up from strip or sheet metal, may be attached to them as circumstances render desirable. Round formers of the rigid type may have end plates of about 16g. sheet metal, secured to them by a tension bolt passing through the centre, as shown in Fig. 6. Centreing discs of any convenient material may be employed to locate the former truly on the bar. Asbestos formers may have clamp supports, of the type shown in Fig. 7, bent up from 1/16 in. strip metal. The slider bar, is in this case, insulated by a plain ebonite bush, gripped by the upper extension of the clamp.

It is often desirable to enclose the entire resistance, for protection against damage or personal injury, in which case, a guard or casing of perforated sheet metal, having a slot to allow the knob of the slider to protrude, may be easily devised and made. In no case must the ventilation of the resistance coil be impaired, as, if the heat generated cannot escape freely, the temperature may build up to a destructive figure.

Many elaborations and improvements upon the simple rheostats described here may be devised, but it is hoped that sufficient data will be found to enable the constructor to satisfy utility requirements, at any rate. The various forms of resistance dealt with may, of course, be used for any purpose within their scope, either as a plain series resistance or a three-pole potentiometer or "potential divider."

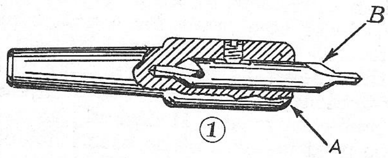
# First Steps in Model Engineering.

## Workshop Advice, Experience and Philosophy for Readers of all Ages.

By "INCHOMETER."

**Concentric Drilling, Mr. P. A. Aubin's Method.**

To assist readers in understanding the explanation given, see "First Steps" of July 16th, I have prepared, and give herewith, a diagram illustration. The part "A" of the drill holder is to be clear of the chuck jaws. The corner "B" of the drill is to be flush with the face of the chuck. Since the description was published I have been told that the method is well known and has been practised for




**Sketch of Mr. P. A. Aubin's centre drill holder.**

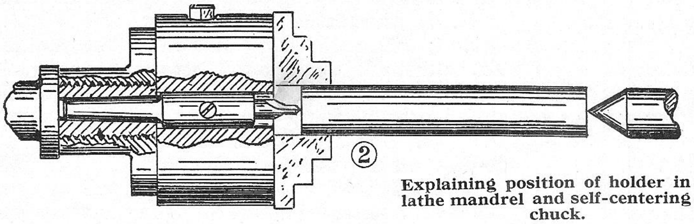
a long period in engineering workshops, also that machines specially devised and used for centering rods are similar in principle and operation.

**Another Method of Concentric Drilling.**

Again, I am indebted to a reader for co-operation towards my endeavour to incorporate practical information in "First Steps" and maintain a standard of usefulness. He is Mr. W. Duncan, M.B.B.E., of Newcastle-on-Tyne, a district eminent in engineering attainment. His method is in converse of the other, to the extent that the chuck and lathe mandrel are held stationary, the drill revolves. He has written as follows, "I have used a somewhat similar method but which obviated the rubbing in the chuck jaws, it could be used on black bar which is rough and often too irregular to revolve in the chuck jaws as described. Also it could be employed on hexagonal bar if need be. A hollow mandrel is essential."

The arrangement uses a taper plug fitting into the mandrel centre hole as in Mr. Aubin's method, also the hole in this takes a "Slocomb", or similar centre drill, but is continued through. The drill is free to rotate, but should be a close fit without any shake. Its rear end has no point or bevel, is flat and provided with a slot as cut in the head of a screw, to receive the blade of a screwdriver. The end of the rod to be centre drilled is put between the jaws of the chuck so far that it is about $\frac{1}{16}$ inch or so away from the end of the plug, the intervening space being to allow the drill cuttings to clear away. Screw the rod by tightening the jaws upon it. Lock the lathe mandrel so that it cannot revolve. A long rod is inserted through from the back, it is provided with a screwdriver end to engage with the slot in the drill. The rod, and drill with it, are rotated by means of a crank brace. Note that the chuck requires to be tight enough on the mandrel nose to prevent screwing off by the cutting effort of the drill. Tendency to unscrewing could be eliminated by using a left hand cutting drill, probably you would have to make such a drill specially. A drawback is substitution of human pressure to the drill instead of having

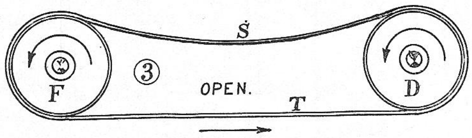
the mechanical advantage and control given when the pressure is applied from a tailstock screw. Further, the lathe may happen to be so located that the headstock is very near to a wall or partition, and, consequently, the screw-driver rod could not be inserted or operated. But I am sincerely obliged to Mr. Duncan for his kindness, and pleased to give publicity to his ingenious and helpful idea. Certainly, it has facility for centering hexagon or square rod and obviates damage to the chuck jaws by rough and irregular surface. Regarding the drill, he has used a "Slocomb" which had lost one of its points by accident, ground this end flat, softened it, and then cut the slot by means of a hacksaw.



Explaining position of holder in lathe mandrel and self-centering chuck.

### About Belt Drives.

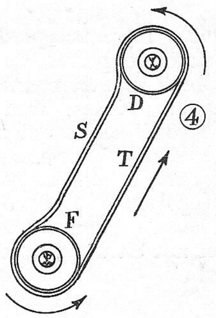
The accompanying sketch is intended to assist you when arranging leather belt drives in your home workshop. There are two principal kinds of belt drive, they are known as open and crossed. With an open drive the connected shafts and pulleys will each rotate in the same direction. A crossed drive will cause or enable the shafts and pulleys to rotate in opposite directions, as indicated by the curved arrows. The belt is given a half twist between the pulleys; a flat belt necessarily runs sideways at the place of crossing and usually, as may be described, rubs against itself at that place. Whenever practicable a belt should be run slack, not strained tightly, with mistaken idea that a tight belt will be the more efficient in transmitting the power. When a belt slips, this, reckoned broadly, is indication that it is being overloaded, replace it by one of increased width rather than resort to tightness as a remedy. The most favourable condition is when a belt drives horizontally, but the drive should be so that the slack side is at the top, and the tight side is underneath. The belt then tends to wrap around the pulleys and give increased hold upon them. If the slack side is underneath the belt sags away from the pulleys, and the grip upon them is diminished. There is no need to have excessive slack. A belt is working in unfavourable conditions when the drive is vertical, therefore have ample width for the power to be transmitted. A slanting drive is mid-way between these extremes, the drive should be arranged so that the tight side is underneath, as indicated by the sketch. A crossed belt is under equal conditions, no matter the position or the direction of drive. In general, and within reasonable limits, the drive is the more favourable when the shafts are far apart than if they are close together. Briefly, a short drive is more difficult and liable to trouble than is a long drive.



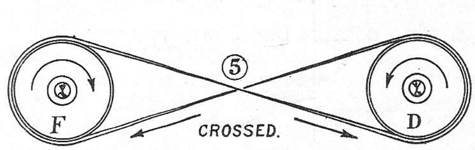
Sketch illustrating horizontal belt drive.

### Joining Leather Belts.

Under normal conditions of sale, leather belting is sold as strip at so much per foot length, and of various widths. You will buy so many feet and inches length, the ends will require to be joined together, so that an endless belt is obtained. A variety of belt fasteners, devised for connecting the ends together, are available; I will not comment upon the pros and cons of any of these. Each has merits and adaptability, I prefer to avoid risk of prejudice for or against one or another of them. Connection may be effected by means of lacing, a leather lace being threaded through holes punched in the belt by the user. It is an old, well established and good method, at least for belts of small and moderate widths. Several styles of lacing are in use. An important matter is that the holes for receiving the lace should be clearly cut by means of a sharp round punch, they should not be made by means of a knife, a bradawl, pointed skewer or similar instrument. Belt laces are strips of flat leather, obtainable from makers and dealers, probably you will not require to use a lace of greater width than $\frac{1}{4}$ inch, the holes to take this should be about $\frac{1}{8}$ inch diameter, for widths of belt you are likely to use. Butt the ends of the belt together, though there is a practice of overlapping the ends a few inches and threading the lace through the overlap. Another method of joining is to scarf (bevel) the ends a few inches and join the lap by means of belt cement. This gives an "endless" belt, smooth and pliable in running but cannot be readily opened by disconnecting the ends. It is convenient, and may be necessary, for a belt to be opened and re-connected at times, a fastener of appropriate pattern affords this facility. Cemented or stitched join endless belts are obtainable to special order from makers of belting. References: T, tight; S, slack; D, driver; F, follower.



Slanting belt drive.



Crossed belt drive.

**Jigs for Grinding Twist Drills.**

From Mr. Duncan's letter: "There was a very lucid article on a twist drill grinding jig in THE MODEL ENGINEER of August 14th, 1913, it went deeply into the whole principles of the thing, a study of it would put your correspondents on the right lines. With the help of this article I constructed a jig myself, with this it seems impossible to go wrong in sharpening drills, at any rate above $\frac{1}{8}$ inch diameter. With regard to drills of $\frac{1}{8}$ inch and under, it is another story and I know of no royal road to sharpening them. I made a jig which you described in the early series of your articles but I must confess to being dissatisfied with the results I get from it though I have not given up hope yet." This last-mentioned device seems to be the jig produced by Mr. G. W. Parsons, of Redhill; several correspondents have testified to making and using this pattern jig, and with satisfactory results. Probably Mr. Duncan has not yet acquired the correct method of adjusting the drill, I hope that he will persevere and succeed. Evidently he is a competent and discerning mechanic; perhaps, is expecting perfection, whereas other users may have accepted compromise, and consider absolute perfection is not possible with very small diameter drills and simple means. The good wishes, and interest towards "First Steps," expressed in your letter, Mr. Duncan, are very heartening to myself; I feel sure, if occasion arises, you will assist with your experience and opinion again. There are many home mechanics, who depend principally, if not entirely, upon THE MODEL ENGINEER as their source of knowledge and guidance in workshop methods and practice. To these in particular, information derived from experience and ingenuity is needed and is very welcome; the givers of this render a generous service, and, no doubt are kindly thought of far and wide, by those whom it has helped along.

**Self Act *versus* Hand Power Feed.**

Usually, pressure feed to a drill or boring bit, applied from the tailstock of a lathe is by hand power rotating the screw. Feed applied by hand power, whether in turning or drilling, has some advantage; the operator is able, by sense of touch, to know if the tool or drill is cutting easily and readily, whether it is meeting excessive opposition or, with a drill or bit, is becoming clogged by cuttings. Hand operation facilitates control but tends to irregularity in rate of feed, it is, however, less likely to produce trouble and breakage when the operator is inexperienced and untrained. A beginner should rather use hand power feed and control than "self act," as it is termed, by gearing provided in a machine itself, until he has obtained some experience of the action of cutting tools upon various materials.

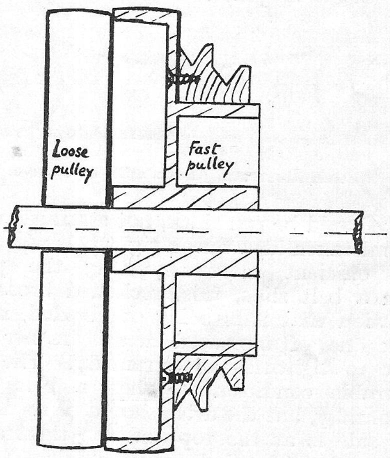
**Self Act by the Tailstock.**

When boring a cylinder, or similar important work, by means of a boring bit, self acting feed, owing to its regular even movement, tends more than does hand feed, to produce a uniform surface. If you are boring the cylinder for an engine, or a pump barrel, for example, the finishing cut should not be interrupted but should continue until the entire surface is machined. This means also that the machine should not be stopped whilst the cut is in progress. Similarly when surfacing in a lathe or a planing machine the finishing cut should not be interrupted, or when turning a rod, a shaft, a roller, or any piece where the surface must be uniformly straight along its length. Self act to the feed is almost essential but is rarely fitted to a lathe tailstock. In the engineering factory where I served my apprenticeship the tailstock was given a self acting movement, for boring purposes, by the following method, the lathe was sliding and screw-cutting with self acting motion to the saddle. The tailstock was placed between the headstock and the saddle, its clamp was tightened sufficiently to keep the tailstock down upon the bed but not tight enough to prevent sliding when pushed by the saddle. The tail end of the boring bit was supported by the tailstock centre. The saddle being against the tailstock and a sliding self act applied to it, continuous and even feed was thus given to the bit. This method operated quite satisfactorily though in a large lathe the tailstock was loaded with heavy slabs of iron instead of being held down by the clamp, so that there was no risk of the latter causing a jamb at any part of the traverse.

## A Useful Pulley Arrangement.

In certain instances it may be desirable to arrange a countershaft which takes up as little space as possible, for driving, say, a lathe; and the method described below fulfils this condition and enables the shaft and bearings to be lighter than usual as the pull of the driving and driven belts is practically in a straight line and, therefore, balanced.

A flat belt pulley with two steps which happened to be available was used and a loose




**Sketch of a useful pulley arrangement.**

pulley of the same size as the larger step provided for shipping the belt. A piece of hardwood, cut roughly circular, was then bored to fit the smaller step of the fast pulley and turned on the outside and grooved as required for the round belt. This wooden section was screwed to the main pulley. It will be seen that, in this way, the wooden part of the pulley cannot warp.—J. A. BUTLER.

# SHOPS SHED & ROAD

## A Column of "Live Steam."

By "L.B.S.C."

### It wasn't Tim's Gear.

Some of our brothers who follow these notes have been tickled by the Hackworth valve gear described for the "Ugly Duckling," and want some more information about it; whether it was originally designed by the builder of the "Sanspariel," "Royal George" and other century-old-timers, whether it is still in use in full size practice, and whether it can be used on a little engine with outside cylinders. To save a lot of direct correspondence, I guess we'll have a few words on the subject right away, being one of general interest.

Old Timothy didn't design the gear that bears his family name; it was, however, a later member of the same family who was responsible for it, to wit John Wesley Hackworth, who took out a patent for it in 1859. As a matter of fact the Hackworth gear is the basis of a goodly proportion of the other radial gears, especially the Joy, Klug and the variation which uses a radial arm instead of a slide and die block, as fitted to a well-known make of steam-driven tarmac roller. I described the latter some long time ago in these notes, and several brothers fitted up locomotives with it, one example being Mr. Geo. Morgan's "Brighton" single-wheeler. The "Marshall" traction-engine valve gear is another example of "Hackworth with variations," but mustn't be confused with the "Marshall" locomotive valve gear, which is a different proposition altogether. So much for its origin. As to its present application, it is not, to the best of my knowledge and belief, now used in any part of the world in regular main-line goods or passenger service; but it has been fitted to a fair number of small industrial locomotives, such as the little shunting tanks working around docks, gasworks, breweries and similar plants. It is a good many years since I saw a Hackworth gear locomotive working; the last time I can recall, was on the West London Extension line. We had just passed Chelsea Station going south towards Clapham Junction and doing our best to blow the chimney off, going up the bank towards the bridge over "old man river," alias "Father Thames." To the right of the line at this point, is the Imperial Gasworks sidings, and there I saw a little tank engine spitting away like an angry cat as she endeavoured to put a jerk into a dozen wagons of "all nobbly." She had outside cylinders and Hackworth gear, worked by a long return crank which extended right across the main crankpin, so that the return crankpin was at 180 deg. to the former. The radius-rod was connected to the eccentric-rod below the die block instead of above it, and the wheels of the engine were turning the opposite way to the slope of the slide blocks. I remember thinking at the time, that whoever designed the little tank, must have been a rummy sort of arab to arrange the valve gear "right-about-face," and I've not to this day been able to see any particular advantage in it, except maybe that

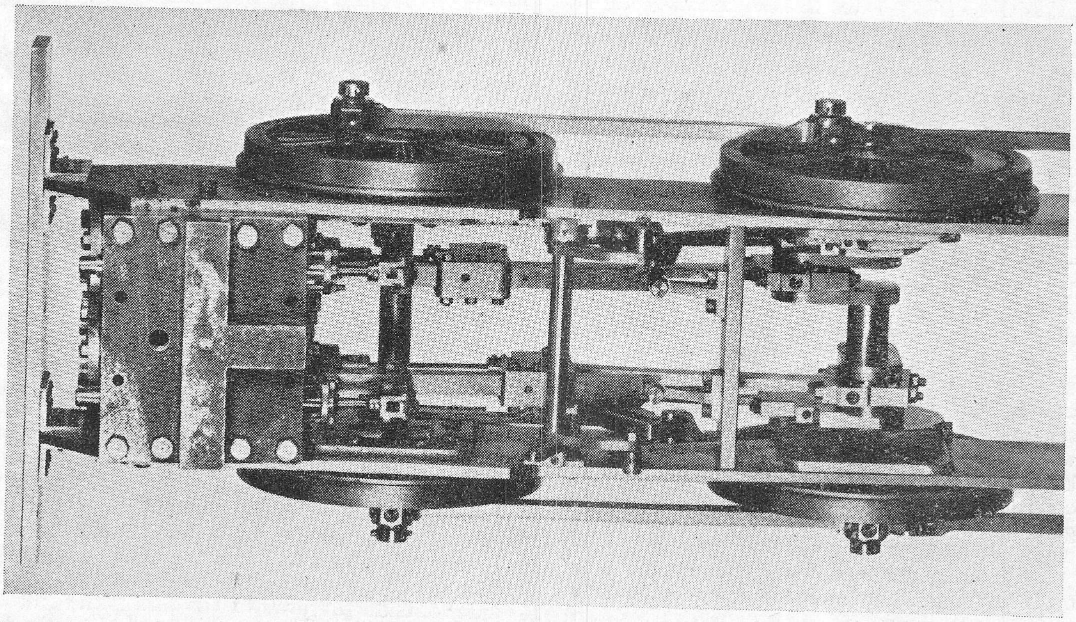


*Photo by*] Model 0-6-0 G.S.R. (Ireland), built by E. J. Cooke [*B. D. Cooke.*

he could get the slide blocks and dies a little higher up on the frames; this perhaps might have been the big idea, to keep them as far away from the dust and grit as possible.

A "twin" to the Hackworth gear is used on the Snowdon Mountain Tramway in Wales, which employs special locomotives, of unique design, for climbing the heavy grades of the "pimple." These tank engines have their cylinders mounted in the middle of the frames, with the piston rods pointing toward the smoke-box. Each crosshead is coupled, by a short connecting-rod, to an exceedingly "Bill Massive type" oscillating lever pivoted to the frames, the ordinary connecting-rod being attached to this lever nearly halfway down. The other end of the connecting-rod is not attached to the crankpin as usual, but to a lug on top of the peculiar taper coupling-rod, in order that the whole driving stress is not taken through the one crankpin, but transmitted to both crankpins equally. Thanks to the kindness of Bro. R. L. Bell, of Yeovil, who made the shot, here is a picture of the whole bag of tricks,

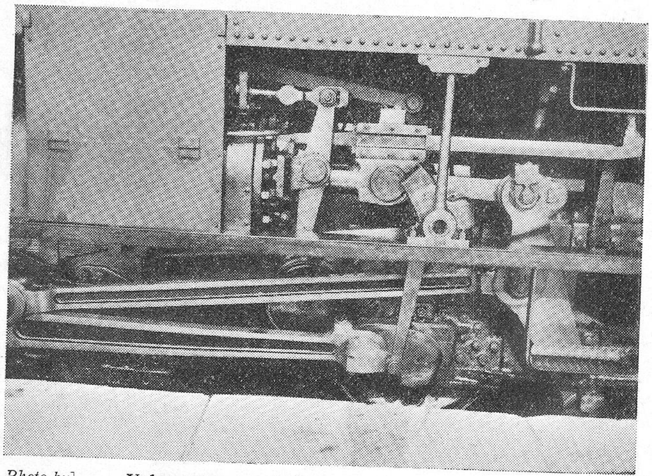


*Photo by*] **Valve-gear on Snowdon Tramway engine.** [*R. L. Bell.*

showing the drive and the valve gear very clearly. The latter differs from the ordinary Hackworth gear in having a curved slide shaft similar to that used with Joy gear. The return crank is short, keeping the return crankpin in step with the main pin, and giving the same effect as the "Ugly Duckling's" eccentric-cum-crank. The connection for the radius rod is below the die block, as in the gasworks engine mentioned above; but this is due to the radius rod driving the valve spindle through a rocker, instead of direct, which of course reverses the motion. Bro. Bell says that the engines do their job in a very efficient manner, and appear to have ample power, but the speed is naturally low on account of the heavy grades. A small sister would make a very interesting job for any brother who wants something out of the ordinary, and likes to see plenty of blobs and gadgets bobbing up and down when the engine is working.

As to using the Hackworth valve gear on an ordinary engine with outside cylinders, this is exceedingly easy, whether the valves are outside and on top, or inside the frames. In the former case, the cylinders, guide bars, connecting rods and so on, are all fitted up in the usual way, and a return crank put on exactly as shown in the picture. The pin should be in step with the main crankpin, and about half the stroke. Next you'll need a bracket, or a girder frame, such as is used for carrying the expansion-links of a Walschaerts gear. This is set above the driving axle; if the engine has big wheels, the girder frame would be best, as it would have to be pretty long to clear the wheel, and could be supported at both ends. The slide-blocks are similar to half of "Mary Ann's" Joy slide-shaft, but the slides are straight instead of curved, so you could plane or mill them out of a bit of square steel. In $2\frac{1}{2}''$ gauge and under, only one side need be channelled out, same as the "Ugly Duckling's"; but for larger sizes, two channelled pieces would be better, set facing one another as in the "Joy" slide. A reversing arm should be attached to each, also a trunion pin, which is mounted in a bush in the frame or bracket, same as the Walchaerts link.

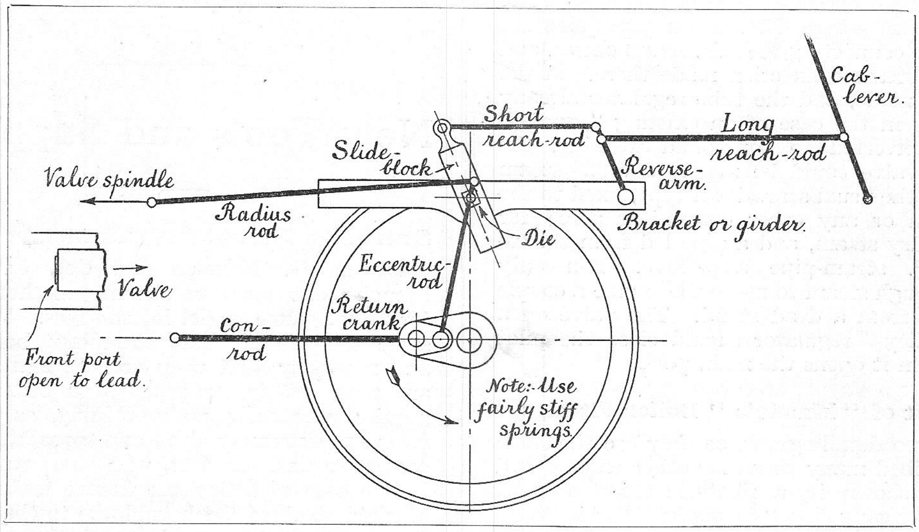
An eccentric-rod is attached to the return crankpin, and passes up to the slide block, where it carries a pin on which is mounted a die sliding in the slot in the block. The eccentric-rod projects above the pin, and the radius-rod is coupled to the extension, same as the "Ugly Duckling's," the other end of the radius rod being coupled to the fork in the valve spindle. As the crank turns, the eccentric-rod pushes the die block up and down the slide, and the engine goes ahead or backs up according to whether the slide is tilted forward or backward, the lap and lead movement being provided by the action of the extension at the top of the eccentric rod. The slide blocks are operated by a weigh-shaft and short reach-rods, a la "Baker"; see diagram which explains itself. When the valves are inside the frame, the job is just as simple. Make up a slide shaft like "Mary Ann's," as given in back notes, but use straight instead of curved slide-blocks, which makes the job a whole heap easier. Mount the same way, but exactly over the driving axle. Mount two eccentrics in the driving axle; in $2\frac{1}{2}''$ gauge these should be about $\frac{1}{4}''$ throw, to give the die-blocks a movement of about $\frac{1}{2}''$. Other sizes in proportion. The eccentric rods are connected to the die blocks as shown in June 4th issue, except that in place of a screw, a plain pin can pass through the eccentric rod and both die-blocks. It cannot come out, because the sides of the slide-blocks prevent it. The end of the radius-rod may be forked to embrace the upper end of the eccentric-rod; or alternatively—and this is a better way really, as you get more bearing surface—the upper end of the eccentric-rod may be made like a Walchaerts combination lever, with a long fork and two pins through it. The lower pin carries the die-blocks on either side, outside the jaws of the fork; the end of the radius rod has a plain eye, and works in

the top pin between the jaws of the fork. The mounting and reversing of the slide shaft assembly is exactly the same as given for "Mary Ann." The forward ends of the radius-rods are set over and connected directly to the valve-spindle forks. As they are out of line, the valve events will not be *absolutely* correct—but don't let that give you any sleepless nights! There isn't a full-sized locomotive running in the whole world, which has *absolutely* correct valve events in both directions at all positions of the gear; *but they are all near enough to be a working proposition*, and yours will be the same!

The 2–6–2 express passenger engine built by a brother in Coventry and illustrated in these notes some time back, has "Hackworth" gear and does jolly well with it. Incidentally, our worthy but shy brother has earned a belated, but none the less deserving ring on the bells, his plea for a full-sized "Prairie" type passenger engine having at long last materialised on the L.N.E.R. in the shape of the new "V 2" or "Green Arrow" class.

axle? Anyway, there they were, and Cooky had to copy them. The comments he passed on the job have nothing to do with these notes—the "boss" probably wouldn't print them if they had!—but the picture shows that another "Battle of Hastings" was fought and won with honours. The links are launch type and the valve movements are very quick; she is set to cut off at 75 per cent. in full gear, and the port openings are O.K. right up to middle. The final drive to the valve spindles is by rocking levers, and the gear is reversed by an overhead weighshaft. Connecting rods are marine type, with single guide bars and box crossheads. The picture shows the rest of the details, including the studded glands. The boiler, now in hand, will be coal fired, and furnished with a "Live Steam" injector in addition to the usual blobs and gadgets.

"Cooky's" letter concluded with the news that he has added a 5" lathe and a milling machine to his equipment; and a precision tool maker who is an ardent loco. fan, has joined forces with him, so we ought to see some




**Hackworth gear for outside valves.**

## A Variation from "Watchmaking."

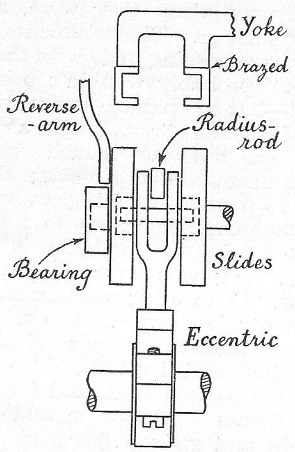
Hitherto the name of Mr. E. J. Cooke, of Hastings has always been coupled with little tiny dots of engines like "Kindergarten, the baby schools," and things of that sort. Cooky served his time at watchmaking, and has a predilection for the microscopic (what do you know about that—aren't I learning?) so when a big envelope arrived with this name on it the other day, I fully expected to find inside, another picture of a wrist-watch outfit. Not to-day, thank you! This time it was something quite a whole heap bigger; a $3\frac{1}{2}''$ gauge 0–6–0 of the Great Southern Railway of Ireland, and a correct small edition of big sister at that. The reproduced picture shows the business end of the chassis, and gives a good idea of the peculiar arrangement of the works of the full-sized engine—sure, begorra, 'twas Pathrick himself who desoigned her! Who else would have squeezed the eccentrics between the crank webs and the axleboxes, when there was plenty of room for them in the middle of the

great doings on the "Conqueror's Coast" in the near future.

## Starting Valve for "Compound Annie."

A brother who is building "Annie" as a Smith compound, after the style mentioned in these notes a few weeks back, wants to know if he should fit a starting valve; and if so, the easiest way to do it. Well, the full-size engines have a jockey valve in the regulator, which admits steam direct to the L.P. cylinders up to the half-open position. The H.P. piston is then more or less balanced, having boiler pressure either side of it, and it merely floats and does no work. Opening the regulator more than half way, shuts off the direct supply to the L.P. cylinders and puts the lot into the H.P. steam chest, so that the engine then works fully compound.

You can't fix this arrangement very well on the tube throttle described in the notes on "Annie," but you can substitute a "Stroudley" type regulator for it, and put a pilot port in. A $\frac{1}{8}''$ pipe could be taken from this, through the




End view of gear arranged for inside valves.

smokebox tubeplate, to a tee on the receiver pipe between H.P. exhaust and L.P. steam chest; or a cross could be used, instead of a tee, at the point where the receiver pipe joins the arch pipe connecting the L.P. steam chests, and the live steam connection made there. If the boiler is made, and the tube regulator already fitted, as in the case of an existing "Annie" being converted to compound working, the starting-valve could be merely a 5/32″ steam valve of the usual screwdown type, fixed to the backhead or any other convenient place for getting dry steam, and a pipe led from this to the L.P. steam-pipe as above. You only need enough steam to move the engine a couple of turns from a dead stand. The valve on a "Stroudley" regulator should close the pilot port when it opens the main port.

**The rest of "Maisie's" Boiler Fittings**—

Need no detailing out, as they are the same as described many times for other engines and will be shown in a photo. coming shortly. The water gauge is a "Stroudley-Washington" with the top fitting attached to an elbow like "Fayette's" to bring it nearly vertical and give easier readings. Blower-valve same as "Dyak," the connections being made to one of the unions on the whistle-turret. A steam gauge reading to 150 lbs. is either connected to another one of the turret unions, or else to a separate union screwed into the wrapper at the back edge, opposite the water gauge fitting, the hole going through both wrapper sheet and backhead flange, same as the steam of the turret. The advantage of a separate gauge attachment is, that when the vacuum brake is operated, there will be a rush of steam from the turret; owing to the momentary drop in pressure in the latter, the steam gauge needle will fluctuate a little if connected to the turret and this will probably give relations and friends of Inspector Meticulous a severe pain in the neck. The brake valve will be described with the completion of the brake gear. A plain swing firehole door is fitted; and as old Bill Massive had a yearning for a blow-off cock, I've provided one right down in the right-hand corner of the backhead. This is merely a plain screwdown valve with a $\frac{1}{4}$″ pin, and has no gland nor handwheel. A square is filed in the end of the pin, and the valve will be operated by a gadget like a chuck key. The outer dome cover and the safety valve cover are machined up from castings. As the next job will be to mount the boiler, and it is easier to put the lagging sheet on when the boiler is off, this job may be done right away. Merely cut out a piece of 26 gauge blue lagging steel (as sold by our advertisers), 17″ long and 14″ wide. At $4\frac{3}{4}$″ from one end, on each long side, make a cut $3\frac{1}{2}$″ long with the snips. Bend the longer section around the barrel, and secure by fine boiler bands made from $\frac{3}{16}$″ spring-steel strip (stuff used for gramophone governor springs does fine); the shorter section will cover the sides of the firebox and hide up all the stay-heads, etc. Fix it to the bottom of the firebox wrapper by a couple of 9BA brass screws each side, tapped into the foundation ring. A make-up piece of the lagging steel is cut out to fit over the throatplate under the barrel, bent over each side, tucked between the firebox and the lagging sheet, and secured by a couple of screws, see coming pictures.

# New Tools and Supplies.

### Some New Hornblocks (Kennion.)

Messrs. G. Kennion and Co., have just brought out some new stamped hornblocks for $2\frac{1}{2}$ in. gauge model locomotives. We have same samples of these stampings before us, and must say that they are excellent. They are produced in best phosphor bronze, and require practically no machining, as all surfaces are extremely clean and smooth, and are correct to size. In fact, with these stampings, it is a case of fitting the frames to the hornblocks instead of the hornblocks to the frames. The only machine work required appears to be the drilling of the holes for the rivets for fixing to the frames. They are, moreover, sold at 4d. each—the same price as the cast type, and they should save hours of tedious work for the amateur. They are designed to suit all "L.B.S.C.'s" locomotives.

### Some Special Tools

We have received from Mr. V. Huffam, Small Tool Specialist, Temple Fortune Works, London, N.W.11, a list of tools which contains a number of items suitable for use in model engineering and precision workshops. These include dividing fixtures, dial indicators, slide calipers, micrometers, lathe and drill chucks, toolmaker's vices, taps, dies, expanding reamers, and adjustable angle plates. This firm specialises in the production of light machine shop and tool room equipment of good design and accurate construction.

# MODEL MARINE NOTES

## In the Wake of the Power Boats.

By THE SPECTATOR.

### What Speedboat Builders Want.

The International Meeting has come and gone and has been fully reported in the "M.E." Poor weather, for the first time for many years, rather put a damper on the day, or at least the latter part of it, but even so, it did not seem quite the usual annual speed festival; the absence of Mons. Suzor and the failure of any other of the competitors to seriously extend the Innocent Bros.' "Betty," no doubt accounted for this loss of atmosphere. We had all been anticipating a three-cornered duel between "Nickie," "Oigh Alba" and "Betty," which did not materialise, as "Oigh Alba" appeared unable to stay on the water at anything over the forty mark.

In the "C" class event, a close race had been expected between "Tornado," "Satalite II" and "Little Star." A high wind and very rough water compelled these boats to be run well inside their maximum, while the runs of the rest were spoilt by floating debris.

### Regatta Reports

Several clubmen I know have mentioned to me views that were expressed to them by visitors to the regatta, on regatta reports. Collectively, they indicate that what is wanted in reports of the events is something similar to that of the motoring press, which concludes reports with a list of the place winner's equipment; for example, at the conclusion of the report: "Bullet," the winner of the five-lap race, is a single step, flat sectioned hydroplane, powered with a "Grayson" engine, "Stuart" coil, "Delco Remy" condenser, "Ever Ready" battery and "Champion" plug. The carburettor is a two-jet with a seven-sixteenth inch diameter choke; B.P. "Ethyl" fuel is used and "Castrol" oil fed through a spring loaded plunger. The propeller is four inches diameter and eight inches pitch. The ignition is automatically advanced after the boat is released by a "Kodak" self-timer. "Carbolic," which took second place, is etc., etc. One visitor told me that some of the boats were a revelation to him, he is a lone worker and has been working on a 30 c.c. engine using a carburettor with a quarter inch diameter choke with a plain jet; he was astounded at the size of choke on some of the engines, and considerably intrigued by the completeness of one or two lubrication systems. He also thought that regatta reports should be instructive as well as interesting. The customer is always right; I, for one, will remember what is wanted when mentioning some particular boat.

### In Reply to the Super Prototype.

I have had one or two letters on the prototype model, from what I term the super prototyper, the super enthusiast, who delights in having everything as near the real thing as can be. They rather frown on our single cylinder "Universal" engine and blowlamp and want triple expansion engines of a method of firing more like the real thing. Well, I agree that a triple expansion engine, high pressure cylinder about ½ in. bore, with reversing gear and condenser, etc., makes a very fine plant, but I do not believe its appeal would be so large as the simpler all-round type I have chosen, which is within the ability of most beginners and suitable for a large variety of boats. A triple expansion engine could not well be built up, and a full description of machining would run into a good many copies of the "M.E." Lastly, readers may have noticed that most of the bits and pieces described in this column have actually been made. I try to make it a rule that anything advocated has been well tried out before publication, so that snags, if any, can be as far as possible eradicated. With the engine being described, I carry out the machining before writing the notes; some parts have been built by a youth who had never seen a lathe close up until three months ago. I thought that this would be a good test of the amount of skill required for any particular operation and at the same time effectively prevent my engine from being anything super compared with a real beginner's effort which may be expected to give results as good or better than mine. I very much doubt if I could find the time to build a triple expansion engine, and without building it I am certain I could not describe every step in a way that could be followed without the fear of slipping up somewhere.

### The Misfortunes of Southampton.

Many readers will be sorry to learn that model speedboats have been banned at Southampton as they are considered too fast and too noisy. I was rather astounded to hear it, as I have spent several short stays in the town and have found it far from quiet; since the club's boats are all round about the thirty miles an hour mark, the powers that be must be on the slow side. There is no compromise, they are stopped until they can find some other water, which is not very easy. One would have thought that, at the most, certain times would have been allotted to the speedboats, such as Saturday afternoon or Sunday morning. Barring them altogether seems distinctly harsh. I doubt if it is the wish of the majority of those usually to be found looking on when boats are running.

**"Adriatic."**

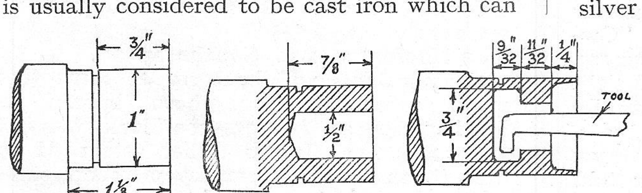
On the opposite page will be found the outline drawings of the design for our prototype model, as suggested by Mr. A. V. Brown, to whom I am indebted for the original drawing from which these have been taken. Let me make it clear that this is not necessarily the model we are going to build, but only a suggestion put forward ; from time to time as we are building the engine, I will try to give lines or photos of different types of suggested designs so that, when we have finished the engine and boiler, we can decide by popular vote what our prototype is going to be.

I have called her the "Adriatic," firstly because it must have a name of sorts, and secondly because it is a type of vessel that is used between the islands and shores of the Adriatic, for combined cargo and passenger work. Note the fine and slender lines which, as Mr. Brown says in his letter, with the white topsides, green boot topping and black funnel with red and white markings, present a yacht-like appearance. It should make a model which would run and steer well. There is no preponderance of deck fittings and at the same time, there is no hint of bareness. Careful attention to the finishing of the deck houses and fittings would produce a really beautiful model exact in detail, without being too delicate to handle. To those enthusiasts who like to do a spot of the designing themselves, there is plenty of scope for variation from the deck upwards. A friend of mine who is a very keen ship modeller of the "glass case" variety, likes it so much that he has persuaded me to get out the sections for it ; from these the hull lines do not present any complications, and, with full details in these notes of the mould and method of plating, even the beginner should be able to turn out something to be proud of.

**The "Universal" Engine.**

By now, our engine is beginning to look like an engine and piston and conrod will mark the halfway stage.

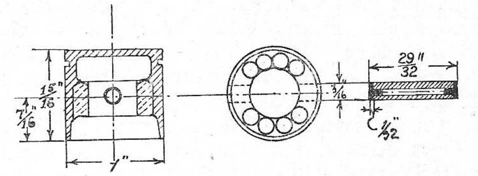
The most suitable material for the piston is usually considered to be cast iron which can




**Three stages of machining the piston.**

be purchased in what is known as sticks, from most foundries. Window sash weights are generally of cast iron and most of the heavier ornamental garden railings. I hasten to add that I am not suggesting that you saw a couple of inches off one or the other, but both are sometimes to be found on builders' scrap heaps. With a cast surface, the iron is rather rough and a diameter of at least $1\frac{1}{8}$ ins. will be required so that the surface can be turned quite clean. Occasionally, the iron gets chilled in the casting and becomes so hard that the tool will not touch it; little can be done with such a piece, you will save time and temper by throwing it away and getting another piece. To those who have a dislike for iron, I can say that I have found chill cast bronze almost as good, though quite as much trouble to turn, so that there is little advantage in using it.

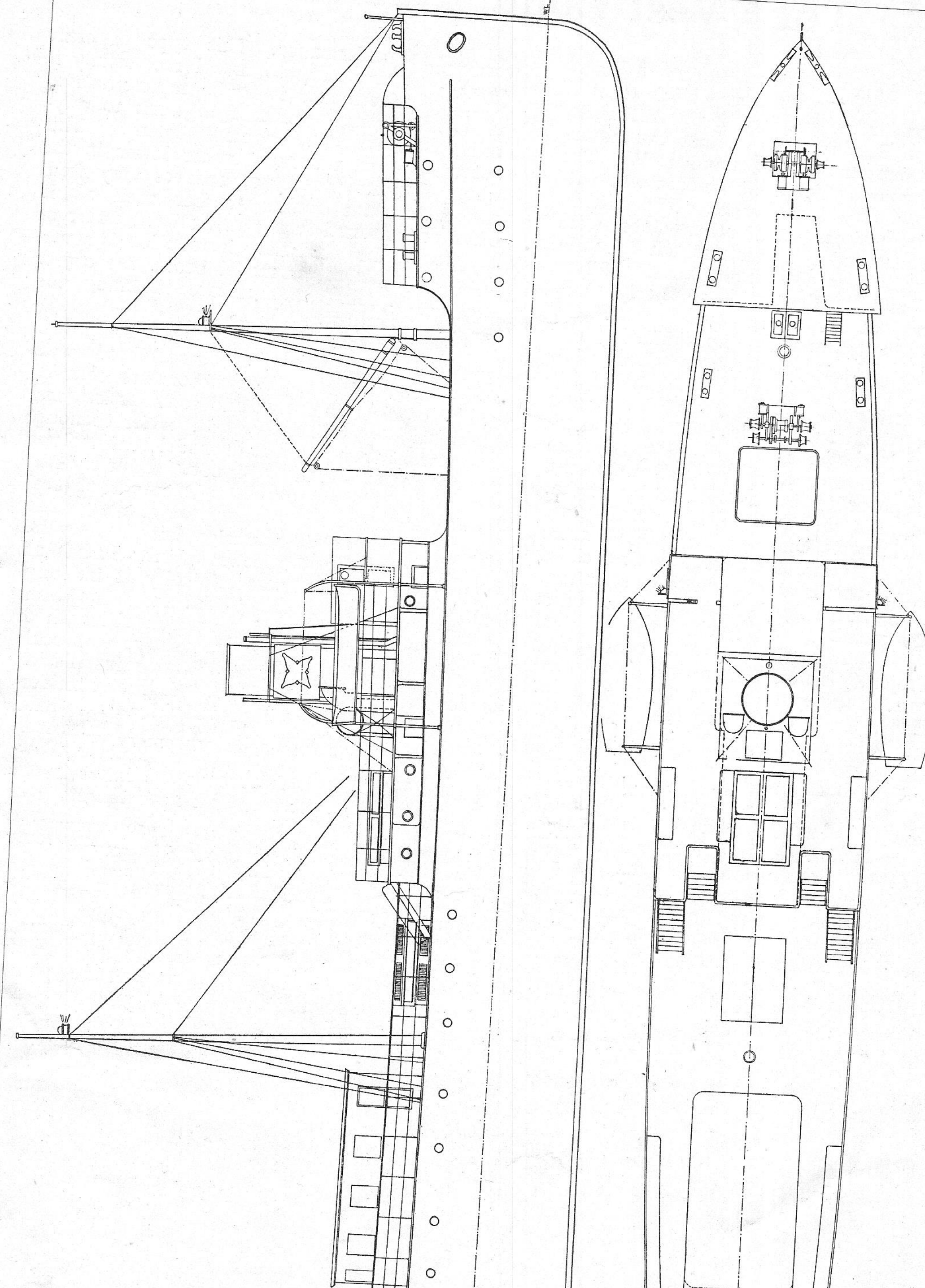
I have sketched out the various stages of machining as explaining the operations much more clearly than a written description. The backgear should be used for the external turning or the tool will lose its temper, and the slowest straight drive for the interior and drilling. Get a 1 in. diameter piston




**The piston and gudgeon pin.**

ring before starting, and machine the groove to a close fit ; the groove should not be more than 1/64 in. deeper than the thickness of the ring. I think I have mentioned before that the rings you can purchase, from one or other of the firms which advertise in the "M.E.," are superior to any you can make. Make the fit of the piston as close to the cylinder bore as you can, finishing off with emery cloth and lapping into the bore with metal polish. It is very important that the hole for the gudgeon pin should be square with the diameter of the piston, and, if no drilling machine or drill pad is available, it is safer to mount the piston on the angle plate mounted on the faceplate, previously marking the centre of the hole which must be got to run true, and then drill and ream in the normal way. The size, 3/16 in., may be considered on the small side compared with I.C. engines ; actually, it is quite large enough and undergoes no such stresses and shocks as the petrol engine inflicts. The gudgeon pin may be made of silver steel and drilled right through with 5/64 in. drill. The end pads, which prevent the pin scoring the cylinder walls, are turned a tap-in fit, from brass or gunmetal. The overall length of the pin with pads in place, should be 29/32 in., which allows a little float.

The interior of the piston is lightened by drilling through the thick rim which forms the bearing of the gudgeon pin ; further cleaning up of the interior can be done with small files, or a flexible handpiece and small cutters, if one is available. It is advisable to leave the actual lapping of the pistons into the cylinder until the interior is finished, as occasionally, with the removal of metal, there is a slight distortion of the iron and the resulting high spots will be taken down by the lapping.



A design for a Prototype Model, suggested by Mr. A. V. Brown.

# The West London Regatta.

A VERY comprehensive selection of prototype boats was to be seen at this regatta, organised under the auspices of the M.P.B.A., and held on Sunday, July 5th, at the Round Pond, Kensington Gardens, London, W. The weather favoured the event, and it was witnessed by a very large crowd of spectators. Among the visitors from other clubs were Messrs. Vines and Johnson, of the Victoria M.S.C., with their well-known boats " Silver Jubilee " and " Nippy " respectively, and Mr. Vanner, of the South London E.P.B.C., with his equally famous " Leda III."

The West London Model Power Boat Club are specialists in prototype boats, as racing craft are forbidden on the Round Pond, and the boats which featured in this regatta comprised specimens of nearly every type, from liners and tramp steamers to drifters and pinnaces, propelled in most cases by steam, though electric and petrol-driven boats were also in evidence. One or two of the more interesting craft are illustrated, but no claim is made that this is a representative selection, owing to the large number of really fine craft owned by members of this club.

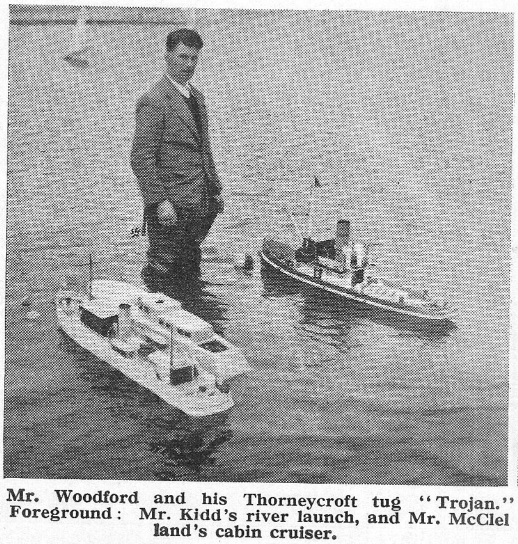
Mr. Woodford's Thorneycroft ocean-going tug, "Trojan," is made, from drawings loaned by Messrs. Thorneycroft, to a scale of $\frac{5}{8}$ in. to the foot. It is 4 ft. 6 in. long by 11 in. beam and 7 in. draught, and is powered by a Stuart " Double-Ten " twin double-acting engine, $\frac{3}{4}$ in. bore by $\frac{3}{4}$ in. stroke, driving a 4 in. propeller. The boiler is of the centre-flue type, with $2\frac{3}{4}$ in. flue, and is fired by twin blow lamps. Engine lubrication is by means of hydrostatic feed to cylinders and syphon feed to the bearings. An interesting feature of the engine installation is a Worthington twin double-acting feed pump, cylinder $\frac{5}{8}$ in. bore and pump barrel 5/16 in. bore.

The destroyer made by Mr. G. Burrows is a veteran of the Round Pond, having been running for several years, and is very consistent in performance. This type of craft is by no means easy to model successfully if working performance is to be representative, as it is extremely difficult to work to anything approaching scale displacement. This boat, however, although rather lower in the water than its prototype, behaves very well, and withstands rough weather such as is often encountered in the unsheltered water of the pond. Its machinery installation is somewhat unorthodox for model boats, the object no doubt being to facilitate trimming the boat fore and aft.

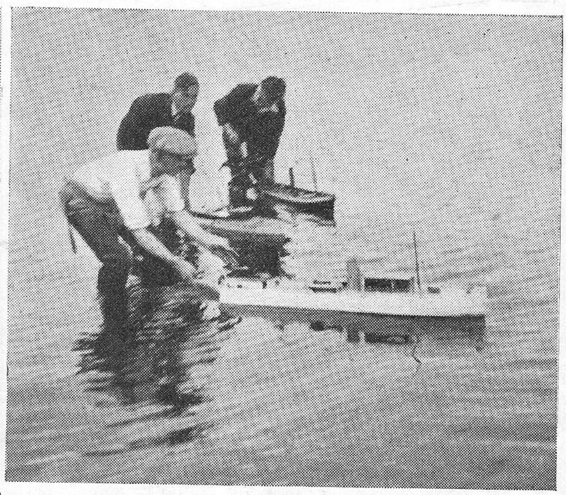
Mr. A. Thomas is a specialist in electric propulsion, and has built several boats with this form of drive. The motors are believed to be of his own design and construction, and perform very efficiently, with better economy of current than is usual in model boat motors.

The river launch " Lagoon," built by Mr. A. Kidd, is an excellent example of real model craftsmanship in respect of design and attention to detail, and also embodies several unique ideas in the power plant. It has an all-metal hull, and was originally 41 in. long, but a centre section 13 in. long has been added this year, making up a total length of 4 ft. 6 in. General proportions are to a scale of 7/16 in. to the foot. Engine installation comprises a Stuart " B.B." engine, considerably modified and improved in detail, fitted with a ratchet-driven mechanical lubricator, and a centre-flue boiler fired by a petrol blowlamp. A unique feature of the latter is the provision of a reserve tank near the stern of the boat, from which fuel can be transferred to the container by a hand-operated force pump ; thus the firing of the boiler can be maintained continuously, even when refuelling.

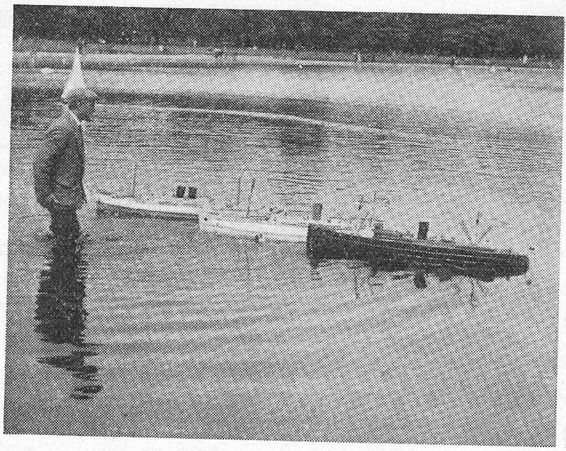
The competitions in the regatta programme included a nomination race, a steering competition, and a race round the pond within course limits indicated by buoys. In the first event, Mr. Vines' " Silver Jubilee "



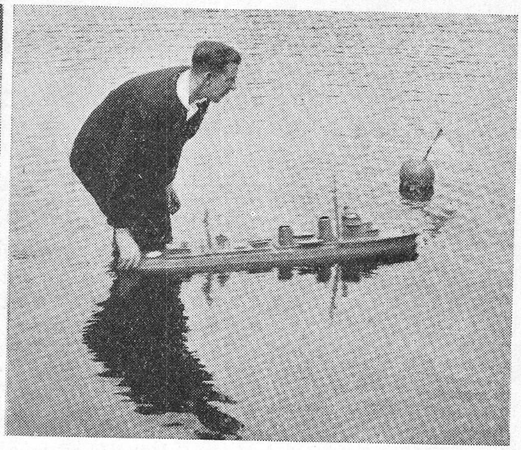
**Mr. Woodford and his Thorneycroft tug "Trojan." Foreground : Mr. Kidd's river launch, and Mr. McClelland's cabin cruiser.**



**Mr. A. Kidd starting "Lagoon" in the steering competition.**



Mr. A. Thomas with three of his electrically-driven boats.



Mr. Burrows starting his destroyer in the Nomination Race

was an easy first, followed by Mr. Kidd's "Lagoon." A number of coloured balloons were employed as buoys to mark the scoring limits in the steering competition, but one of these, by anticipating its natural fate at an untimely moment, caused some confusion in the scoring of Mr. Vanner's "Leda III." It was, however, placed second, the highest score being again made by "Silver Jubilee." The round-the-pond race, a famous feature of the West London Regattas, was won by Mr. Beard, of the home club, second honours going to Mr. Butler's fine old veteran, "Mary Dean," which is well known by sight, and also by the sound of her melodious whistle, to all model power boat enthusiasts in the London area.

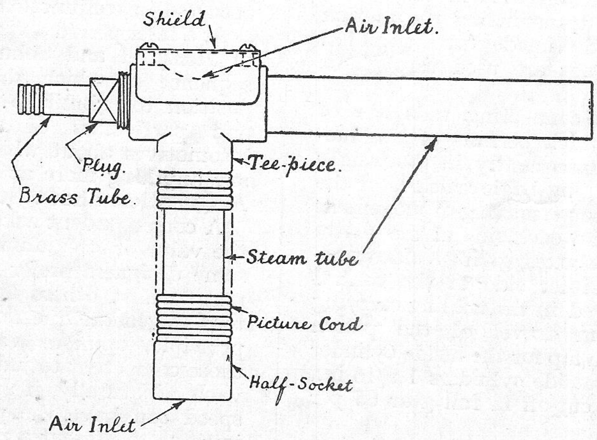
At the presentation of the prizes, Mr. W. Thornton Parry, Commodore of the Club, acknowledged gratefully the contributions to the prize fund made by Messrs. Bond's o' Euston Road, and the MODEL ENGINEER.

# A Self-Blowing Gas Brazing Gun.

This brazing gun is very simple and cheap to make. The whole idea is to use standard steam pipe and connections, etc. The construction is clearly shown by the drawing. A tee piece is used and into it the barrel is screwed. The handle is another piece of tube with a socket cut in half and screwed on the end, the space between the half socket and tee piece being bound with picture cord. This makes a fine handle. The bore up the handle is used for air inlet.

Into the back end of the tee piece is screwed the nozzle, which simply consists of a standard pipe plug drilled about $\frac{1}{16}$" diam. and opened out to receive a brass connection piece for connection to rubber tube from gas supply. This should be driven in tight and grooves can be cut on it to grip the rubber tube connection as shown.

A further air hole is cut in the top of the tee, as shown dotted, and a sheet iron shield is fitted over this to protect the gas jet from outside draughts. It is screwed in position, with distance pieces about $\frac{1}{4}$" long underneath, to allow for the ingress of air. The correct size of air holes and jet can only be found by experiment. A considerable amount of adjustment can be made by closing the air inlet up the handle. Correct adjustment also depends on the local gas pressure which is never the same in different localities.




Sketch of arrangement of self-blowing gas brazing-gun.

One advantage of this method of construction for a brazing gun is that it can be made in any size required, as standard steam tubing and connections are obtainable in all sizes. A small gun for delicate jobs may be made of brass tubing and connections as used for gas fittings.

When obtaining correct size of air inlets, it is best to start with a small hole, and to increase, gradually until a good hot flame with a steady roar is the result. Size of air inlets will, of course, vary with size of gas nozzle. It is possible, by careful experiment, to get very good results with this type of gun.—STANLEY B. JONES.

# LOCO. PROTOTYPES NEWS and NOTES

By CHAS. S. LAKE, A.M.I.Mech.E., M.Inst.L.E.

### The L.N.E.R. "Lord President."

With further reference to the new series of 2-8-2 type three-cylinder express engines built at the Doncaster works of the London and North Eastern Railway the first of the series, No. 2003 "Lord President" is illustrated herewith. The front end is designed similarly to that of the "Silver Link" engines, experience having shown that this form of construction is entirely successful in lifting the smoke clear of the cab windows.

Of the four engines to be constructed, three will have boilers identical with those of the "Cock o' the North" type engines, but the boiler of the fourth will be somewhat altered in its proportions. It will have a longer combustion chamber giving a firebox heating surface of 253 sq. ft. and a firebox volume of 319 cu. ft. The firegrate, which is fitted with narrow firebars giving 56 per cent. air space, has an area of 50 sq. ft. A 43-element Robinson superheater is used, and the elements in this case extend to within 9 in. of the copper tubeplate. The chimney and blast pipes are of the double pattern, fitted in conjunction with "Kylchap" cowls. Doubtless those who scrutinise this design will be at a loss to understand what method of access to the main smokebox door is provided. This is obtained through doors in the front streamlined case, one of these doors lifting upwards and the other falling downwards over the buffers. Hand-operated bevel gearing is used for operating the doors. The whistle is of the chime pattern, fitted in the front of the chimney.

The three cylinders are cast in one piece, all driving the second pair of coupled wheels, the piston rods and heads being forged in one unit of what is known as "Class C" steel. Narrow rings are fitted to the piston valves, which latter are 9 in. diameter, Walschaert gearing being used for the valves of the outside cylinders and the Gresley system of two-to-one and equal levers transmitting the motion from the outside to the inside valve spindles. Ball and roller bearings are used throughout the valve gear.

The coupling and connecting rods are of nickel-chrome steel which permits of a reduction of section and, consequently, in the weight of the rods. The leading bogie truck is of the double swing link type permitting of movement corresponding to $5\frac{1}{2}$ in. each side of the centre line. "Cartazzi" axleboxes, giving a side translation of 3 in. on either side of the central position, are employed in the trailing carrying axle. The maximum travel of the piston valves is $5\frac{5}{8}$ in., steam lap for the inside cylinder $1\frac{5}{8}$ in., and for the outside cylinders 1 9/16 in., exhaust lap nil and cut-off in full gear 65 per cent.

The overall dimensions and other particulars are shown on the accompanying drawing, whilst the photographic reproduction shows the external appearance of the engine from the left-hand side.

### Items of Locomotive Interest in Germany.

The writer recently spent a vacation in Germany, and was much interested to note the locomotive arrangements on the narrow gauge lines in the Harz mountain district operating between Nordhausen, Wernigerode and the summit of the highest peak in the mountain range which is known as the Brocken. In order to avoid grades such as would necessitate the use of rack locomotives, the line takes a very zig-zag course and is an excellent example of engineering construction. The trains which are of a mixed character, passenger and freight vehicles, are for the most part worked by Mallet compound tank engines of the 0-4-4-0 type, built at various times by the Borsig Locomotive Works, Henschel and Sohn and other firms. These appear to be easily capable of performing all the work entrusted to them and the higher section of the line, namely between Schierke and the Brocken, is only open during the summer months for ordinary traffic although a part of it is utilised while the winter sports are on.

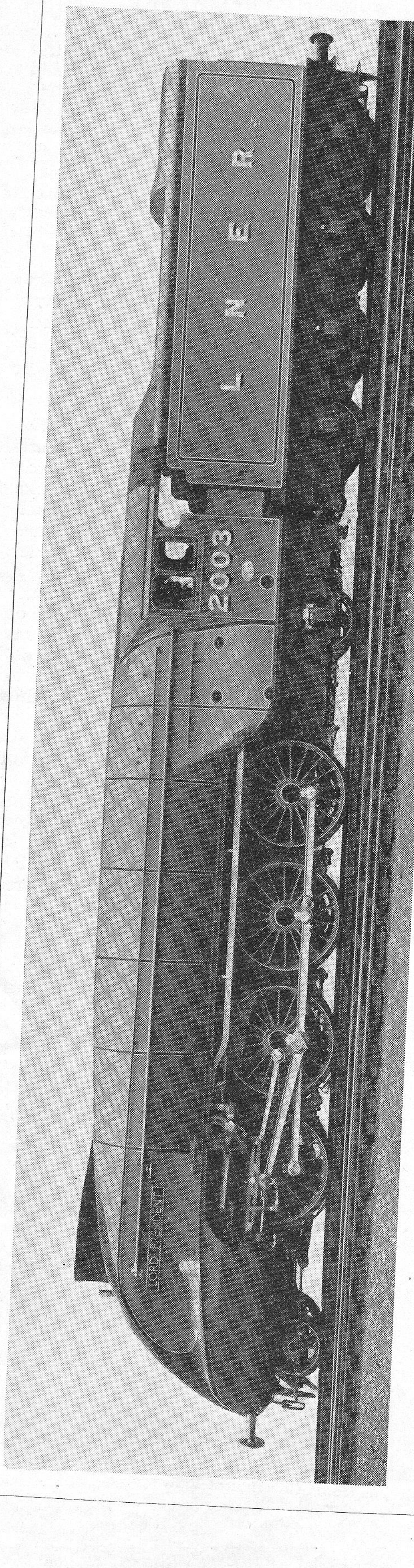
In addition to the passenger traffic, which is fairly heavy during the summer months, there is a considerable tonnage represented by the transportation of timber which appears to be a thriving industry, special open-sided wagons being used for stacking the tree trunks, the vehicles being of the double bogie pattern. As is only to be expected, the average speeds are low on both the ascents and descents, the line being laid on the metre gauge.

At no time during the writer's observations were any of the engines in difficulties; in fact it was a remarkable demonstration of maintaining steady pulling with little or no variation of speed except where very sharp curves and, perhaps, more than usually difficult grades occurred in conjunction with one another.

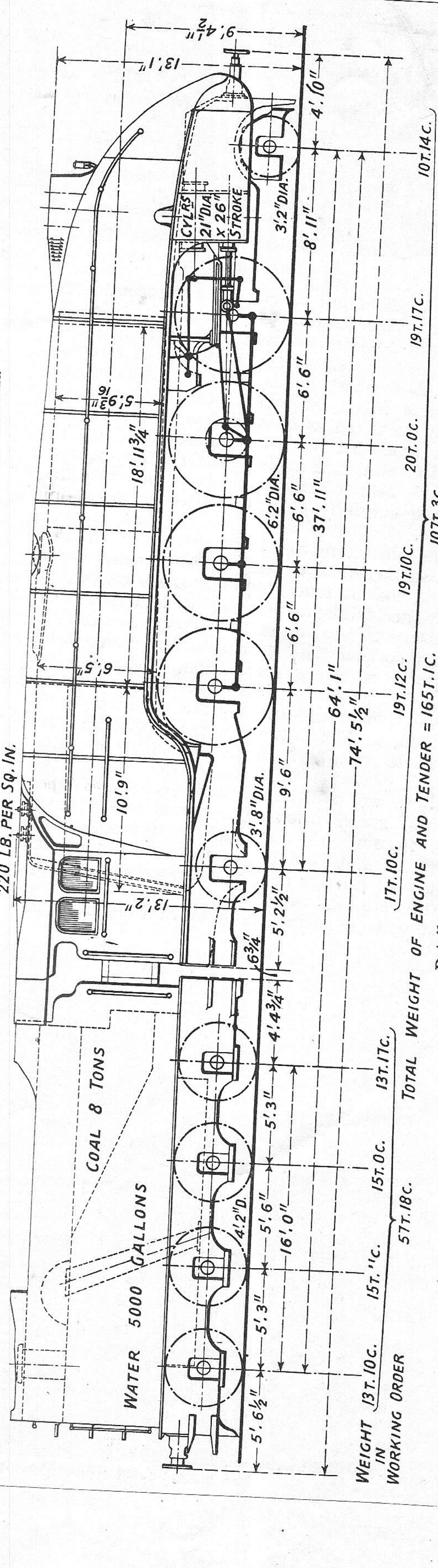
At a later period a visit was paid to the works of Henschel and Sohn in Kassel, as a consequence of which the writer will be in a position to submit to the editor photographs and particulars of some very interesting locomotives about which it is not possible to say anything more at the moment.

### A Question about Streamlining.

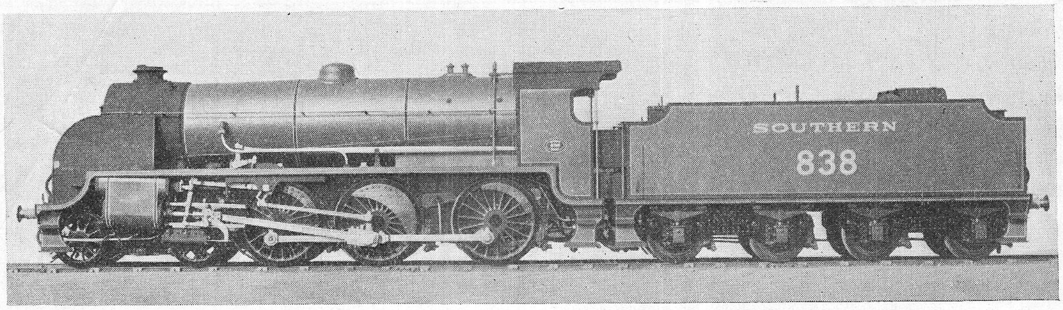
A correspondent asks the writer's view as to the value of streamlining and the reasons why some designers prefer to cover in the moving parts whilst others leave them exposed. As to the general question of streamlining as a principle, opinions vary considerably among those competent to judge as to its fundamental value. Naturally, if an object moving at high speed can have the projecting parts covered in so as to present a more or less flush surface throughout the resistance offered by the air is




New 2-8-2 type, 3-cylinder streamlined express locomotive "Lord President," L.N.E.R.




Details of new L.N.E.R. 2-8-2 express engine.




One of the new "S-15" class engines of the Southern Railway.

reduced. This not only applies to locomotives but to other forms of construction as well. As might be expected, some rather exaggerated claims have been made on behalf of streamlining, but where, as is mostly the case, the design is based on wind tunnel experiments it may be taken as certain that all reasonable claims made for the principle are borne out, in practice, and that higher speeds and no doubt reduced coal consumption may be realised from a carefully designed streamlined locomotive.

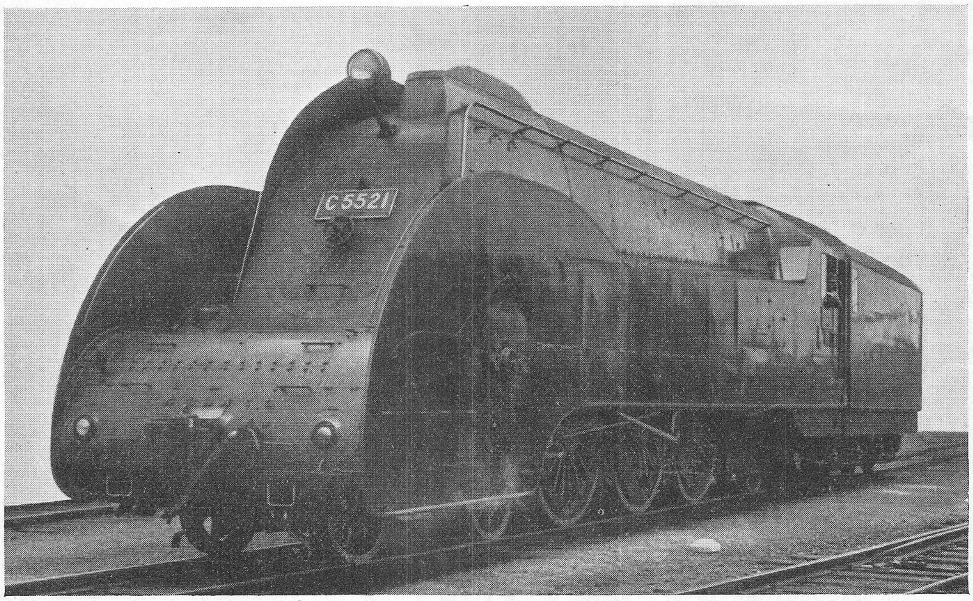
The objection to the covering in of the mechanism, incorporating the wheels, rods, etc., is that it tends to make these parts less easily accessible; and where it is done, it is necessary to provide doors or flaps at suitable points, so that the enginemen may gain access to parts requiring lubrication, and more or less frequent inspection. Some designers regard this as unnecessary and a thing to be avoided, and it is a moot point whether the complete shutting in of all the parts is justified, except, perhaps, in special cases where the engines are used solely and entirely for the highest speeds with streamlined rolling stock and running on very fast special schedules. Even then, it is doubtful whether the results would be inferior in any degree if the moving parts were left exposed.

It will be noticed in both of the examples reproduced herewith, namely the 2-8-2 of the L.N.E.R. and the 4-6-2 of the Japanese Railways that the coupled wheels are left uncovered, although in the second instance the casing is carried lower than in the first one.

### Japanese Streamlined Locomotives.

This engine is a standard Pacific type of the Japanese Government Railways rebuilt with streamlined casing. There are two outside cylinders 20 in. diameter by 26 in. stroke driving the centre pair of coupled wheels which have a diameter of 5 ft. 9 in. The streamlined cowling extends over the engine and tender and the front end, together with the chimney, is inclined. Various detailed improvements have been carried out in the streamlining of this locomotive, as compared with a previous one of the Japanese State Railways, and tests are being made with a view to ascertaining to what extent the extra cost of the streamlining is justified in comparison with the ordinary Pacific engine of the same class.

The weight of the engine and tender in working order is 114 tons 18 cwt. The tender carries 3,740 gallons of water and 12 tons of coal. The total evaporative heating surface is 1,361 sq. ft., and of the superheater 445 sq. ft. The boiler carries a working pressure of 200 lb. per sq. in., and the firebox has a grate area of 27.2 sq. ft.




Streamlined 4-6-2 type express locomotive, Japanese Government Railways.

### New Locomotives for the Southern Railway.

Recently completed at the Eastleigh works of the Southern Railway, a new series of 4-6-0 type engines have been built to the design of Mr. R. E. L. Maunsell, Chief Mechanical Engineer, by whose courtesy one of their number is illustrated herewith. The design embodies a number of features introduced on the "King Arthur" class namely long-travel piston valves and several other details. The engines will be used for fast freight and mixed traffic purposes, and the first five will have bogie tenders of the straight-sided type with electrically-welded tanks and disc wheel centres. The capacity of the tender is 5,000 gallons of water and 5 tons of coal. The second five are to have six-wheeled tenders, and the length of the engine and tender over-all will be reduced to 61 ft. 3 in. with total wheelbase of 51 ft. 3¾ in. for working over the central section of the Southern Railway. The engines with bogie tenders have a total wheelbase of 57 ft. 1½ in., and a total length over buffers of 65 ft. 1½ in.

The particulars of the ten engines now being completed are as follows :—

| | |
|---|---|
| Cylinders (2) | 20½ in. dia. 28-in. stroke. |
| Coupled wheels | 5 ft. 7 in. dia. |
| Boiler pressure | 200 lb. per sq. in. |
| Tractive effort | 29,860 lb. (at 85 per cent. B.P.) |
| Heating surface— | |
| Small tubes | 1,252 sq. ft. |
| Large tubes | 464 ,, |
| Firebox | 162 ,, |
| Total | 1,878 ,, |
| Superheater (1 3/32 in. dia. elements) | 337 ,, |
| Grate area | 28 ,, |
| Coupled wheelbase | 13 ft. 9 in. |
| Total wheelbase | 26 ft. 7½ in. |

The engines, which present a handsome appearance, weigh in working order with tender 135 tons 13 cwts., and they are classified as the S.15 class.

# QUERIES and REPLIES

**Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.**

**6,675.—Chuck for 3″ Lathe.**—P.T.A. (Consett).

**Q.**—I have in my possession a "Portass" 3″ B.G.S.C. lathe, and also a 4″ four-jaw chuck. I am at present constructing a ½″ scale loco., which entails a good deal of milling work. Can you advise me on the best type of 3-jaw, self-centreing chuck to purchase? There are some 3″ lever scroll chucks made by F. Burnerd and Co., which are much cheaper than the geared variety, but I am dubious of their gripping power for milling work.

**A.**—The chuck in question is as good and strong as you need, and has the advantage of a minimum overhang. It should have a steel body and scroll, and as far as our information goes, this chuck has both. We suggest, however, that you check this.

There are usually lever holes in the knurled ring to operate the scroll for closing, and it is an excellent idea to make, or have made, a ring or pin spanner embracing rather more than a quarter circumference of outside of ring, and fitted at point with a well fitting pin to the holes. This spanner may have a 6″ handle, or longer.

In tightening the chuck with the spanner, do not operate against the screw nose and shoulder of mandrel by holding, or blocking up the lathe spindle, but block up the chuck itself in one of two ways as follows :—

If the screw heads on adapter flange at back of chuck are sufficiently positive, set one at back of lathe on centre or thereabouts, and block up under it with the hardwood block (oak, grain end on, for preference) with the block of such length that it will stand either in the lathe gap or on bed in front of headstock. Then to loosen with the spanner, put the same block at front. The block then acts as a stop as near to spanner action as possible. If this cannot be done, stop against the flat side of a jaw set horizontally and with block *close* to chuck body.

In setting work in chuck or holding delicate work, operate by hand always, and only use the power spanner when needing to hold work tightly.

**6,635. —Adjusting Lathe Headstock Bearing.**—A.B. (Barnsley).

**Q.**—I have purchased an 8″ centre lathe, which was advertised in THE MODEL ENGINEER some time ago.

I am perfectly satisfied with the lathe, as everything seems in good order, excepting the headstock front bearing, the bush of which has a slight play in its housing.

The front bearing is slightly tapered, but it cannot be pressed further home in its housing, as it is already a tight fit at the larger end, and is flush with headstock casting.

No provision is made for adjustment of the bushes, as they are solid, that is, not split; adjustment is provided for in the headstock spindle, which is solid, with a solid cone at the front end, and an adjustable cone at the rear.

Is it possible to remedy the defect?

**A.**—The error mentioned should be only slight, and we suggest that it can be remedied by knocking the head end bush out from the tail end of it, removing the dowel, and grinding in the bush to its housing with granular emery

with water, or carborundum paste. This can be effected by mounting the bush centrally on the screw of a bolt, and having nuts and washers at each end, with which the bush is gripped. Washers should not overlap the outer diameters of bush, and a carrier should be used on bolt shank for turning it. Most of the powder or paste will be used at the large end (i.e., tight end), and only just enough be done to tighten the tail end or make the bush taper tally with the casting taper.

The effect will be to deepen the bush, but only slightly, and then, perhaps, the head thrust can clear the bush opening at the head end. In any case, this gives the general idea, but whether the effect of the head end collar acting as a thrust on the front head end of bush is going to give trouble is a matter for conjecture, as you do not state whether this occurs. Apparently the slight projection of the bush at tail end, if any, will not matter if left. The dowel can again be used to key the bush when satisfactorily fitted, and presumably there is sufficient thread to accommodate the adjusting nut on spindle, which will now have to go this little further along to eliminate end shake.

**6,672.—Ox-Gall.**—G.W. (Morfa Nevin).

**Q.**—I have read and studied with much interest a book published by Percival Marshall and Co., called "The French Polisher's Handbook," by "A Practical Man."

I have found this book to be very instructive and easy to follow, but there are one or two minor instances with which I have experienced some difficulty. According to the chapter concerning the use of ox gall it states that the ox gall should be clarified through a piece of bone charcoal.

The chemists supplied me with ox bile stating it to be the same, but I could not clarify it in the manner described in your book, and when I dissolved it in spirits, it proved to be tacky and remains so when applied to the polished surface. Could you please enlighten me regarding this.

Also, could you let me know if there is a special process as regards to preventing the polish from lifting when applied to lavatory seats and bar counters, owing, in the first case to the weight and heat of the body, and in the latter instance to so much spirits being spilt on it.

**A.**—It would appear likely to save you much trouble if you purchase a bottle of clarified ox-gall as prepared for artists' use by such firms as Reeves, Winsor and Newton, or Rowney. Any good artists' colourman can procure this for you. We have ourselves never used ox-gall in the manner described; rather would we prefer to use fine pulverised pummice applied with a camel hair brush and polished off with a soft clean cloth, working the way of the finishing strokes, after the spirit has hardened. It gives a more artistic finish to dull down the excessive brightness of surface, rather than to enhance it, and further is to resist the action of body heat.

Referring to lavatory seats, we presume that by "spirits" you mean "spirits of salts" (i.e. impure hydrochloric acid), but this should not lift polish if worked off quickly. Bar counters, however, which are liable to the action of some form of alcohol (i.e. spirits of wine), since this is the principal and only solvent generally used to dissolve shellac, it will always lift french polish if allowed to come in contact with it. We should think that for such fittings, either wax or oil polish would stand a better chance against alcohol.

**7,116.—Questions concerning 3-phase Motors.**—F.D. (Birmingham).

**Q.**—Can you please tell me why 3-phase slip-ring type 440 volt motors should vary as regards their rotor currents? For instance I find that in the case of a 20 h.p. motor the rotor current is as much as 59 amperes, whereas with a 25 h.p. motor it is only 24 amperes. Does each of the three cables between the rotor starting resistance and the slip-rings carry the full current as given on the motor rating plate?

**A.**—The current circulating in the rotor winding of a 3-phase slip-ring type motor has no relation to the line voltage, but depends upon the actual number of rotor conductors, the speed and the flux in the air-gap, in the same way as would an ordinary d.c. generator armature. The rotors may be wound with few turns of heavy gauge wire, in which case they would generate a low voltage and carry a heavy current—or they might be wound with a larger number of turns of smaller wire, and generate a higher voltage and carry a smaller current. In either case, the loading in watts being approximately the same, and closely related to the watt loading in the stator winding. The current per line wire is not the same as the full rated input current shown on the name plate, but is ascertained by multiplying HP × 746 × 100 and dividing by the volts between phases × efficiency per cent. × power factor × 1.73, thus :—

$$\frac{BHP \times 746 \times 100}{V \times E \times PF \times 1.73}$$

You would find considerable information on this and similar points in our Handbook "Electric Motor Management," post free 3/11, from our book department.

**7,118.—Chucks.**—C.G. (Glasgow).

**Q.**—Please state, what, in your opinion, is the best type of chuck (lever scroll or geared scroll) for a "Portass" 2½ in. centre lathe.

**A.**—For the size lathe you refer to it would scarcely be possible to use more than a 2½ in. diameter chuck, and it is doubtful whether you can easily obtain a 2½ in. geared chuck. In any case, if you can, its overhang, or distance projecting from the front lathe bearing, would be rather excessive, and, therefore, it appears better to use a lever controlled scroll chuck in this case. If you have any difficulty in tightening such a chuck, purchase can be obtained by putting a hardwood block under a jaw on further side of lathe bed, and tightening over with the lever against it. Some makes (Continental generally) of these chucks provide a ring or pin spanner with short shank handle which can be operated driven into a short length of iron tube. These are better for tightening than the usual lever.

# PRACTICAL LETTERS from OUR READERS

## The Stirling Model Single Loco.

DEAR SIR,—In the "M.E." for July 2nd, your contributor, "L.B.S.C.", gives a description of an 18 in. gauge G.N.R. single locomotive, and as there are one or two inaccuracies in his account of the career of this engine, the writer would like to have the opportunity of giving the history of this engine, and also of another similar one.

I will deal with the last mentioned engine first.

In the year 1893, Messrs. W. G. Bagnall, of Castle Engine Works, Stafford, built an 18 in. gauge 4-2-2 miniature locomotive on the lines of Patrick Stirling's G.N.R. 8-ft. singles, and it was numbered 778. This engine was built to the order of the Marquis of Downshire and ran for some years on a track laid round his estate, there were also some passenger carriages with open sides and seats and canopy tops.

This engine, as would be expected from such a famous firm of light locomotive builders, was a beautiful job and a most successful worker, it had a large polished brass dome casing and the Ramsbottom safety valves were entirely uncased even at the base. The working pressure was 140 lbs. per sq. inch. The cylinders were 4 in. bore × 6½ in. stroke. There was a brass plate on each driving wheel spasher, bearing Messrs. Bagnall's name and the date of construction.

The engine and carriages were illustrated in the "Strand Magazine," about the years 1893-95.

After some years, this locomotive was sold to Messrs. Bedford and Co., of Shaftesbury Avenue, London, who removed Messrs. Bagnall's name plates and substituted their own. An old friend of the writer's, the late Mr. W. Spiller, told him that the engine was purchased from Messrs. Bedford and Co. by Mr. J. F. Popham, an amateur yachtsman of some repute, for use as a ballast engine on some constructional work at Hamble, Hants., many years ago. Mr. Spiller obtained some new plates bearing Messrs. Bagnall's name, and removed those put on by Bedford's.

Mr. Spiller drove this engine several times and said that it was very fast and a splendid steamer. On one occasion it was driven by someone round the sharp curves of the constructional line at such a speed that it left the rails and turned over on its side but did not damage itself or the driver much.

What eventually happened to it the writer does not know, but as it had done a very large amount of work with very indifferent maintenance, it was probably long ago worn out and scrapped. The writer had at one time a large photograph of this loco. under steam which was taken at the makers and which he gave to Mr. Spiller.

The writer believes that the Editor had a similar photograph in his office at Farringdon Street. It was also illustrated in the "M.E.," April 12th, 1906, and November 1st, 1923. The locomotive illustrated and described by "L.B.S.C." was completed much more recently and its history is as follows: Towards the end of last century, the Regent Street Polytechnic Engineering School purchased a complete set of drawings, castings, etc., of this engine, from Messrs. Bagnall, of Stafford, the makers of the engine just described, as a suitable engine for the students to build. The mechanical instructor at the school was a Mr. Rogers, an ex-G.W.R. loco. man.

This model was never finished at the Polytechnic, as after some years Mr. Rogers died and interest in the model died out.

The late Mr. E. Notter, of the G.N.R. Railway Co., purchased the engine in an incomplete state, and finished it by about the end of the year 1911. I was acquainted with Mr. Notter in the course of business, and in 1912 or 1913 he asked me if I could find a buyer for it, as it was too large to run in his garden. Mr. Notter told the writer that he had done a large amount of work on the engine, not only in adding to it, but in remaking some of the parts, as owing to it having been made by many different students of varying skill, some parts were well made and fitted, while others were very much the reverse. The writer believes Mr. Henry Greenly did some of the work on this engine while he was a student at the Polytechnic. Mr. Notter also gave the writer an excellent photograph of the engine showing him seated in the tender, but this unfortunately has been lost. He also gave the writer the following list of dimensions of the model:—

Gauge, 18 in. Wheels, driving, 2 ft. 6 in. diameter; bogie, 1 ft. diameter; trailing, 1 ft. diameter; tender, 1 ft. diameter. Wheelbase, engine, 7 ft. 8¼ in.; tender, 6 ft.; total, 13 ft. 8¼ in. Distance between bogie wheel centres, 2 ft. 1½ in.; bogie to driving centres, 2 ft. 9¾ in.; driving to trailing centres, 2 ft. 9 in. Length over buffer beams (engine), 9 ft. 5 in.; length over buffer beams (tender), 5 ft. 8¾ in. Height of chimney top from rail, 4 ft. 6¾ in. Length of chimney, 1 ft. 3⅛ in. Cylinders, 4 in. bore × 6 in. stroke. Width over cylinders, 2 ft. 5¾ in. Width over footplates, 2 ft. 4¼ in. Diameter of blast pipe nozzle, 1¼ in. Diameter of boiler (inside), 1 ft. 3 in. Length of boiler between tubeplates, 4 ft. 7¾ in.; length of boiler overall (without smokebox), 6 ft. 3½ in. Steam pressure, 140 lb. per sq. in. Heating surface, firebox, 7.3 sq. ft.; grate area, 1.3 sq. ft.; tubes, 45.6 sq. ft.; total, 52.9 sq. ft. Number of tubes, 26, = 20 1⅝ in. outside diameter; 6 1⅜ in. outside diameter. Tank capacity of tender, 45 gallons.

The writer then lost touch with this engine until it was illustrated in the "M.E." of May 12th, 1932, running on the Fairbourne Light Railway, near Barmouth. Mr. Notter numbered this model "No. 1" after the famous G.N.R. exhibition engine, which was, in 1912, reposing in Kings Cross sheds.

There is just one other point. "L.B.S.C." says: "Unfortunately the original builders of the engine fell into the then prevalent 'small cylinder' tray and the cylinders are only 4 in. by 6 in. instead of the correct size which should be something like 6 in. by 9 in."

This seems to the writer to be a rather sweeping statement, and he would ask what is "prevalent small cylinder trap"? Considering that the engine was built from drawings prepared about 1891 or 1892 and that the firm who got out the design and drawing were then, and are now, narrow gauge locomotive designers and builders of vast experience; the writer would say that they should know best, and in any case the "prevailing tendency" in full gauge loco. work in those days was towards *over* cylindering.

Messrs. Bagnall's model was fairly lightly built, and if cylinders of the size proposed by "L.B.S.C." had been used, the axleboxes, motion and other parts would have been of insufficient size to stand up for long without excessive wear and tear, and in addition, the engine would have slipped badly at 140 lbs. per sq. inch pressure on the light section rails on which it ran.

It was designed by Messrs. Bagnalls, Ltd., for a specific duty in semi-skilled hands, and this it performed most satisfactorily.

Yours faithfully,

Brixton. G. S. WILLOUGHBY.

# Institutions and Societies.

### The Society of Model and Experimental Engineers.

Meetings. At Caxton Hall, Westminster, at 7.0 p.m.

Next meeting: Friday, 11th September. Debate on Steam v. Electric Traction as a subject for modelling.

Secretary: R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

### Farnborough Model Power Boat Club.

ANNUAL REGATTA AT COVE RESERVOIR ON SUNDAY, 23rd AUGUST.

12.30 p.m. NOMINATION RACE. Nearest to 30 m.p.h., 500 yards, open. In this event a prize will be given for the highest speed attained by boats in the 15 c.c. class.

1 to 2. LUNCH INTERVAL.

2 p.m. FARNBOROUGH CHALLENGE CUP. 500 yards. Open to International Class Speed Boats not exceeding 30 c.c. capacity.

3 p.m. TOWING FOR THE FARNBOROUGH MARROW.

3.30 p.m. STEERING.

Joint Hon. Secs.: Mr. G. HARRIS, Mr. R. O. PORTER, Windy Cot, Woodlands Grove, South Farnborough, Hants.

### Nottingham Society of Model and Experimental Engineers.

Notification of change of Secretaryship. All communications in future should be addressed to:—Hon. Sec., H. WILSHAW, 98, Kent Road, Mapperley, Nottingham.

### The Derby Society of Model and Experimental Engineers.

The last meeting of the above society was held on July 9th, 1936, when Mr. Lampard started a discussion on "Models in General." Owing to an illness Mr. Whitehead was unable to deliver his lecture.

The next meeting will be held on Thursday, August 20th, 1936, at the Cavendish Cafe, Corn Market, Derby, at 7.30 p.m., when Mr. Whitehead will deliver his lecture on "Railway Signals and Signalling."

All model engineers in the district are cordially invited.

ALBERT G. SALE, Hon. Sec., 31, Thornhill Road, Littleover, Near Derby.

### The Manchester Model Railway Society.

Meetings for August are: Thursday, August 13th, meeting at headquarters at 7.30 p.m. Saturday, August 15th, visit to the L.M.S. Motive Power Depots at Crewe. Saturday, August 22nd, visit to the L.N.E.R. Running Sheds at Trafford Park, Manchester. Tuesday, August 25th, meeting at headquarters at 7.30 p.m.

## Notices.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. Unless remuneration is specially asked for, it will be assumed that the contribution is offered in the general interest. All MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co., Ltd., 13-16, Fisher Street, London, W.C.1. Annual Subscription, £1 1s. 8d., post free, to all parts of the world. Half-yearly bound volumes, 11s. 9d., post free.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 13-16, Fisher Street, W.C.1.

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# SALES AND WANTS

## EVERYBODY'S MARKET for ENGINEERING & SCIENTIFIC ELECTRICAL GOODS

*Advertisements are inserted in these columns at the rate of* **One Penny per word**; *minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

**Advertisers who wish to separate** *their announcements into distinct paragraphs must have not less than 20 words in any one paragraph followed by the word "Below"—which is charged for.*

**"Box" replies,** *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address.)* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box——, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

**All advertisements in these columns must be prepaid,** *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

*Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—*

**General, Models, Wireless, Motoring, Tools, Engines, Electrical, Business, Wanted.**

*Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue,* **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Holb.: 3818-3819.*

### OUR DEPOSIT SYSTEM.

*We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1. In cases of persons not resident within the United Kingdom, double fees are charged.*

*The amount of the deposit must be sent either by Postal Order or Registered Letter.* **(Cheques cannot be accepted.)**

**The fee mentioned above should be sent in stamps or by Postal Order as a separate amount.**

*In cases of exchange, money to the value of the article should be deposited by each party.* **We cannot receive the articles themselves.**

## General Supplies

**Cheap Printing.** 1,000 Billheads, 3s. 6d. Samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

**Small Turned Screws Nuts and Washers.** Assorted gross B.A., brass 2s., steel 2s. 6d. Whitworth, brass 3s., steel 2s. 6d. List and samples 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction, N.W.10.

**Reduced Prices: Eureka Improved Air Compressors.** Castings and Drawings from 9s. per set. Photo 3d.—POYSER, Peck's Hill, Mansfield.

**"Maxspray" Electric Paint Spray Plants,** £5 5s. complete.—JOHN M. E. STEEL, Bingley.

**Air Compressors.** New patent, 25s.; Super Spray Guns, 17s. 6d. Complete plants.—JOHN M. E. STEEL, Bingley.

**American 8 Valve All-Wave Receiver,** 12-2,000 metres, A.C., 110-250 V, 7 watts output, 2 months' old, cost £15 15s., offers, or exchange for ¾" or 1" Scale Loco., incomplete or needing repairs considered, cash adjustment.—J.T., 27, Silverdale Gardens, Hayes, Middlesex.

**New Printers' Type and Cases,** cheap. List.—YOUNG, 7, Baytree Road, Weston-super-Mare.

**"Cyclopedia of Engineering,"** Manual of Steam and Machine-shop, 1,000 engravings, 7s. 6d.—157, Uttoxeter Road, Derby.

**10" Circular Saw,** 3s.; Blue Prints, Refrigerator and Spot Welder, 1s. 6d. each; Tone Arm and Sound Box, 2s. 6d.; Pyrene Pump, 6s.; 3 Switches and Voltmeter, 1s. 6d.; Old Lever Chuck, 6s.; 4 Self Aligning Ball Races, odd m.m. reamers, etc.—Box 1067, MODEL ENGINEER Offices.

**Bright Mild Steel Rod** in 3' lengths, 2 each 3/16" and ¼", 1 each 5/16", ⅜", ½" diameter, 21' for 2s. 6d., post paid.—PARKER'S, 84, Northgate, Wakefield.

**Great Need of Cash.** £5, Ten Rater Yacht, worth double, real bargain.—48, Victoria Road, Mill Hill.

**"Oil Engines for Road, Rail and Air Transport"** (incorporating "Compression-Ignition Engines for Road Vehicles"), 5s. net, 5s. 6d. post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street. W.C.1.

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# The MODEL ENGINEER'S DIARY
## OF FORTHCOMING EVENTS.

**August 22nd—North Staffordshire Models Society.** Model Power Boat Regatta at Smith's Pool, Fenton, Stoke, commencing at 3 p.m.

**August 23rd—Cup for Autogiro Models.** General Competition.

**August 23rd—Model Power Boat Association,** Farnborough.

**September 6th—Cup for Biplane Models.** General Competition.

**September 17th-26th—"Model Engineer" Exhibition.** Royal Horticultural Hall, S.W.1. 11 a.m. to 9.30 p.m. daily.

**September 20th — Second Annual Northern Rally of Aeromodellists,** Manchester Airport, Barton, at 12 noon.

**September 27th—Model Power Boat Association,** Victoria Park, London, E. (Grand Regatta).

**October 8th, 9th and 10th—Norwich and District Society of Model Engineers.** Third annual Exhibition to be held in Norwich.